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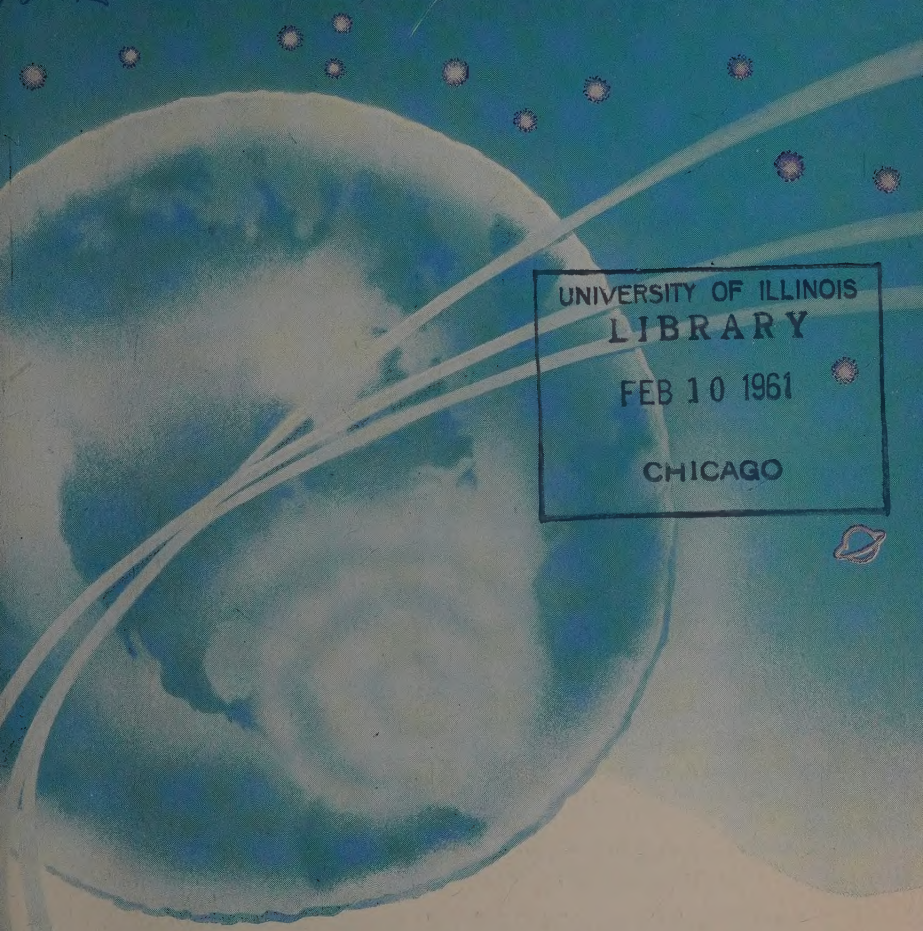

Meteorological & Geoastrophysical ABSTRACTS

Vol. 11 AUGUST 1960 No. 8

METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

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METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS is a monthly publication devoted to:

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METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

MALCOLM RIGBY, Editor

Vol. 11 August 1960 No. 8

AGRICULTURE · COMMERCE · AERIAL AND MARINE NAVIGATION · PUBLIC HEALTH · INDUSTRY · ENGINEERING
AMERICAN METEOROLOGICAL SOCIETY
1919

Supported by
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
NATIONAL SCIENCE FOUNDATION
UNITED STATES WEATHER BUREAU

Special Feature in This Issue

Recent Literature on Radar Meteorology
By
Andrew J. Meglis and Robert Panara

(*For table of contents see back cover*)

Published monthly at Prince and Lemon Streets, Lancaster, Pa., by the AMERICAN METEOROLOGICAL SOCIETY, 45 Beacon Street, Boston 8, Mass.

Printed and issued by: Lancaster Press, Inc.

FOREWORD

Meteorological and Geoastrophysical Abstracts is a monthly publication whose purpose is o bring to the attention of meteorologists, geophysicists and astrophysicists current literature n their field.

Part I contains abstracts of current literature in the fields of meteorology, etc.

Part II of each issue comprises an annotated bibliography of important references on a pecial subject. Bibliographies published in the successive issues were:

Vol. I, 1950

. Atmos. Pollution 2. Aerobiology 3. Cloud Physics 4. Hail
. Tornadoes 6. Volcanic Dust 7. Climat. Changes 8. Thunderstorms
. Icing 10. Acoust. Propagation 11. Evaporation

Vol. II, 1951

. Extended Forecast. 2. Long Range Forecast. 3. Soil Temp. 4. Constants, etc.
. Clim. of Near East 6. Clim. of Middle East 7. Special Winds 8. Radar Storm
. Condensation Trails 10. Clim. of N. E. Africa 11. Mountain Met. Detect.

Vol. III, 1952

. Clim. of N. W. Africa 2. Carbon Dioxide 3. Clim. of Argentina, etc. 4. Dew
. Objective Forecast. 6. Stratus Forecast. 7. Urban Climatology 8. Clim. of C. Africa
. Visibility 10. Glaze and Rime 11. Free Air Turbulence

Vol. IV, 1953

. Turbulence Theory 2. Turbulent Diffusion 3. Frost 4. Clim. of Australia, etc.
. High Level Winds 6. Winds in Stratosphere 7. Jet Stream 8. Radiation Bioclim.
. Clim. of Pacific 10. Auroras 11. Sferics

Vol. V. 1954

. Oceanog. Met. 2. Clim. of S. E. Asia 3. Auroral Physics 4. Tropopause
. Balloons 6. Numerical Forecast. 7. Radiation Data 8. Vertical Motion
. Clim. of Arctic 10. Industrial Met. 11. Wind Waves and Swell

Vol. VI, 1955

. Bibliog. of Bibliog. 2. Texts & Monogr. Bibliogs. 3. Storm Surges
. Ionospheric Prop. 5. Photochem.—Upper Atmos. 6. Cloud Physics
. Radar Cloud Physics 8–9. Atmos. Nuclei 10. Weather Modification 11. Cooling Power

Vol. VII, 1956

. Synoptic Met.-Arctic 2. Clim. of Enclosed Spaces 3. Cosmic Rays (–1952)
. Cosmic Rays (1953–56) 5. Atmos. Radioactivity 6. Inversions
. Snow Micromet. 8. Snow Micromet. (Suppl.) 9–11. Tropical Cyclones

Vol. VIII, 1957

. Solar Weather Relations 2. Night Airglow 3. Forecasting Special Elements
. Forest Micrometeorology 5. Hydromet. Forecasting 6. Numerical Forecast. (Suppl.)
. Albedo 8. Meteors 9–10. Tropospheric Prop. 11. Medical Meteorology

Vol. IX, 1958

. Radioastronomy 2. Solar Astrophysics 3. Radioactivity in Atmosphere
. Waves and Currents 5. Physical Oceanog. 6. Dynamic & Phys. Oceanog.
. Long Range Forecast. 8. Radar Met. 9. Cosmic Rays 10–11. Geomagnetism

Vol. X, 1959

1. Works of C. E. P. Brooks 2. Tornado Forecasting 3. Soil Moisture 4. Sferics
–6. Ozone 7. Acoustic Waves 8. Evaporation Measurement
9. Evapotranspiration (–1955) 10. Evapotranspiration (1956–1959) 11. Evaporation

Vol. XI, 1960

. Outstanding Reference Works 2. Outstanding Texts 3. Numerical Forecast. (Suppl.)
. Ionospheric Physics 5. Ionospheric Propagation 6. Ionosphere
. Forecast Verification 8. Radar Meteorology

Other bibliographies in preparation are:

irglow *High Atmosphere Temperatures* *Rocket Meteorology*
urora *Precipitation Chemistry* *Satellite Meteorology*

Part III contains a listing of reviews, translations, reprints, and the contents of important ublications. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. The December issue omprises cumulative author, subject, geographical and journal indexes.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where th material may be found. The Union List of Serials (Gregory) is the source of most of th symbols used. In some cases, where no symbol has been assigned to a library, one will h devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DNLM:	U. S. National Library of Medicine, Washington, D. C.
DSI:	Smithsonian Institution, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by chart
Ⓢ	after an abstract indicates an abstract prepared for NASA.

Geographic locations are in the English form rather than the form used locally, for exampl Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwi stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet using a modific tion of the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months a abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Numb (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus a entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau, Jahrgang* 2 (Vo 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL AND GEOASTROPHYSICAL MATERIAL

A. GENERAL

1. COLLECTED WORKS

11.8–1 629.19(08)

U. S. Air Force. Office of Scientific Research, **Vistas in astronautics: first annual Astronautics Symposium, Feb. 1957.** N. Y., Pergamon Press, **1958.** 330 p. figs., refs. (*International Series of Monographs on Aeronautical Sciences and Space Flight*, Div. 7, Vol. 1). (For listing of pertinent articles, *see Met. Abstr.*, 10(2):316, Feb. **1959.**) Review by D. G. Hing-Hele in *Nature*, London, 184(4687):663, Aug. 29, **1959.** Also its: **Vistas in astronautics: second annual Astronautics Symposium, Denver, Colo., April 1958.** N. Y., Pergamon Press, **1959.** 18 p. figs., refs. (*International Series of Monographs on Aeronautical Sciences and Space Flight*, Div. 7, Vol. 2). (For listing of pertinent articles, *see Met. Abstr.*, 11(4):633, April 1960.) **DWB** (629.1388 U581as), **DLC** (TL787.U5). Review of Second Symposium by D. G. Hing-Hele in *Nature*, London, 186(4718):59–60, April 2, **1960.**—The first *Astronautics Symposium* was held in San Diego in Feb. 1957 and the second at Denver, April 28, 1958 with over 600 scientists and technicians present. These two volumes of proceedings are done in first class style, and contain upwards of 100 (50 each) articles grouped according to the following major headings: in Vol. 1, Pt. I. Re-entry, II. Tracking and communication, III. Environment and measurements, IV. Propulsion, V. Orbits and VI. Human Factors; in Vol. 2, Pt. I. Space environment and Vacuum research, II. Control and propulsion outside the atmosphere, III. Panel discussion on manned space flight, IV. Departure, navigation and re-entry, and V. The moon (exploration and dust). Articles on planetary atmospheres (G. SOLOMON, abstract only); meteorite risk (F. L. WHIPPLE, p. 115–125); gas composition and measurement (N. W. SPENCER, p. 130–134); solar activity (W. O. ROBERTS, p. 135–139); solar x-rays and ionosphere (H. FRIEDMAN, p. 140–145); cosmic rays (H. V. NEHER, p. 159–161); effect of atmosphere on satellite orbit (J. DE NIKE, p. 263–272) in Vol. 1; and Dust on the moon (T. GOLD, p. 261–266, and F. L. WHIPPLE, p. 267–272) and Exploration of moon (G. P. KUIPER, p. 273–313) in Vol. 2, are of special interest to meteorologists. Both volumes are well indexed and contain the discussion and the introductory remarks of leading experts. *Subject Headings:* 1. **Astronautics symposia 2. Space flight 3. Lunar exploration. I. Wooster, Harold** (*ed.*) **II. Alperin, Morton** (*ed.*) **III. Stern, Marvin** (*ed.*) **IV. Gregory, Hollinsworth F. V. Vistas in Astronautics.**—*M. R.* ⑤

11.8–2 551.5:061.2

Sonnblick-Verein, Vienna, **Jahresbericht** [Annual Report], **Vol. 51/53, for 1953–1955.** Taub. Vienna, Springer-Verlag, **1957.** 75 p. **DLC**—Contents: Steinhauser, F., **Die säkularen Änderungen der Sonnenscheindauer in den Ostalpen (Beiträge zur Kenntnis der Klimaschwankungen, I).** [Secular variations of sunshine duration in the eastern Alps (Contribution to the knowledge of climate variations, Pt. 1.)] p. 1–27. Hoinkes, H., **Über die Schneeumlagerung durch den Wind.** [Snow redistribution by wind.] p. 27–32. Tollner, Hanns, **Bericht über die Eisstände der Gletscher der Grossglockner- und Sonnblickgruppe im Frühherbst 1954, 1955 und 1956.** [Ice conditions of glaciers in the Grossglockner and Sonnblick group in early autumn 1954, 1955 and 1956.] p. 33–38. Tollner, Hanns, **Die Folgen des Rückganges österreichischer Gletscher auf die Wasserspeicherung hochalpiner Kraftwerksanlagen.** [The effects of the retreat of Austrian glaciers on the water supply of high Alpine power plants.] p. 38–42. Roller, Maria, **Schneepegelbeobachtungen im Sonnblickgebiet im Zeitraum 1927 bis 1956.** [Snow depth gage measurements in the Sonnblick region from 1927 to 1956.] p. 43–45. Prohaska, Fritz, **Über die meteorologischen Stationen der hohen**

Kordillere Argentiniens. [Meteorological stations in the High Cordillera of Argentina.] p. 45–55. Arlt, Wilhelm, **Ein Beitrag zur Flora des Raurisertales.** [Contribution to the flora of the Rauris Valley.] p. 55–59. Narholz, Sigmund, **Sagen aus dem Raurisertal.** [Sagas from the Rauris Valley.] p. 59–71. **Bericht über die Tätigkeit des Sonnblick-Vereins in den Jahren 1954–1956.** [Report on the activities of the Sonnblick Society in 1954–1956.] p. 71–72. (Some papers abstracted separately.) *Subject Headings:* **1. Annual society reports 2. Sonnblick Society 3. Austrian Alps.**

2. TEXTBOOKS AND TECHNICAL BOOKS

11.8–3 52(02)

Schroeder, Wolfgang (*Br. Astronomical Ass'n.*), **Practical astronomy.** [London], Werner Laurie, **1956.** 206 p. 76 figs., 20 maps, 17 refs., p. 191–192 plates. Price: $6.00. **DLC** (QB145.538). Review by Frances W. Wright in *Optical Society of America, Journal*, 49(1):106 Jan. **1959.** Transl. into German as **Praktische Astronomie für Sternfreunde,** issued Stuttgart, Kosmos Franck'sche Verlagsbuchlandlung, **1958.** 180 p. Price: DM 14,80. Review of German transl. by Martin Rodewald in *Der Wetterlotse*, Hamburg, No. 124:237–241, Nov. **1957.** —Elementary astronomy without recourse to mathematics other than that inherent in use of graphical aids to calculation, and with no attempt at explaining the origin of the universe or stars, their evolution and decay, etc. The fourteen chapters cover the courses of the stars, constellations, the path of the sun, time planets and their orbits, the moon, the astronomical calendar, the telescope, observing with a telescope, etc., with illustrations showing star maps, sundials, astrolabes, quadrants, reflecting telescopes, solar eclipses, sunspots, nebulae, double clusters, globular clusters, etc., and scores of useful nomograms and diagrams. *Subject Headings:* **1. Astronomy textbooks 2. Elementary astronomy.**—*M.R.*

11.8–4 532(02)

Targ, S. M., **Osnovnye zadachi teorii laminarnykh techeniĭ.** [Basic problems of laminar flow theory.] Moscow, Gosudarstvennoe Izdatvo Tekhniko-Teoreticheskoĭ Literatury, **1951.** 420 p. 65 figs., 7 tables, numerous eqs. **DLC** (QA929.T3)—In this theoretical textbook the solutions of some concrete problems concerning laminar viscous flow of a liquid are analyzed. The nine chapters of the book deal with: 1) equations for incompressible viscous liquid flow; 2) and 3) simplest steady and unsteady flows of viscous liquid confined by solid walls; 4) and 5) steady and unsteady flows of viscous liquids at a boundary layer; 6) development of viscous liquid flow in pipes; 7) and 8) viscous liquid flow in diffusers and lubricants; 9) problems of heat exchange in the movement of drops of viscous liquid. *Subject Headings:* **1. Laminar flow theory 2. Viscous liquid flow 3. Laminar flow textbooks.**—*A.M.P.*

3. POPULAR SCIENCE BOOKS

11.8–5 91.04(99):087.5

Strong, Charles Stanley, **The real book about the Antarctic.** Garden City, N. Y., Garden City Books, **1959.** 216 p. Illus. **DLC** (G880.S8)—A popular account of the nature and exploration of the Antarctic up to and including IGY 1957–58 expeditions. *Subject Headings:* **1. Antarctic exploration 2. Juvenile literature.**—*M.R.*

4. HANDBOOKS—MANUALS

11.8–6 551.594.5(02)

U. S. Weather Bureau, **Manual for aurora observations (provisional).** Wash., D. C., U. S. W. B., Dec. **1956.** 16 p. forms. **DWB** (M94.5 U587m)—Brief description of aurora followed by detailed instructions for hourly observation, codes, forms for recording, mark-sensing punched cards, etc., and of mailing instructions. *Subject Heading:* **1. Auroral observation manuals.**—*M.R.*

11.8–7 551.5:531.5

Belgium. Force Aérienne. Service Météorologique, **Météorologie balistique.** [Ballistic meteorology.] Its *Manuel* No. 11, May **1957.** 57 p. 11 figs.—Meteorological problems of

artillery are discussed, including observation of the weather elements involved (temperature, humidity, pressure, wind), computation of the ballistic elements (ballistic wind, density and temperature), codes and messages, acoustic sounding, and use of synoptic data. The station SCM12 and its operation are described. *Subject Headings:* **1. Applied meteorology 2. Ballistics 3. Meteorological services 4. Belgium.**—*A. V.*

11.8–8 551.501.1:551.576.12

Netherlands. Meteorologisch Instituut, **Determineertabellen voor de bewolking.** [Tables for identifying cloud forms.] De Bilt, **1955.** (7 p.) **DWB** (M76.12 N469d)—Systematic cloud identification sketches and instructions for observers to use in coding clouds, arranged in 3 tables for low, middle, and high clouds, respectively, and with varieties and species differentiated. *Subject Heading:* **1. Cloud coding manuals.**—*M.R.*

11.8–9 551.5:681.177:025.354

Canada. Meteorological Div., **Manual of card punching.** Its *CIR*-3231; CLI-20, July 20, **1959.** 27 p. figs., forms. **DWB**—This manual prescribes the standard procedures and practices laid down by the Meteorological Branch for the preparation of punched cards. In order to secure uniformity on the North American Continent and internationally, much use has been made of the "Manual of Card Punching" issued by the United States Weather Bureau and close coordination is being maintained with the WMO and ICAO on the development of improved procedures. This manual contains only the instructions for preparation of punched cards of the hourly aviation weather reports. *Subject Headings:* **1. Punched card manuals 2. Aviation meteorological data.**—*Author's abstract.*

5. IGY—ARCTIC—ANTARCTIC

See also: **Antarctic exploration** (Strong), 11.8–5; **Tbilisi Hydrometeorological Research Institute session** (Khmaladze), 11.8–18; **Thermal regime, western Soviet Arctic** (Petrov), 11.8–197; **Temperature variations during polar night** (Hisdal), 11.8–219; **Temperature changes in Antarctic** (Wexler), 11.8–229; **Tropospheric-stratospheric compensation, Antarctic** (Loewe), 11.8–231; **Plant phenology, Subarctic** (Andreev, Vakhmina), 11.8–317; **Optical phenomenon in Antarctic** (Mitin), 11.8–321; **Bibliography on whiteout** (Harker), 11.8–322.

11.8–10 551.509.2/3:551.506.22

Rubin, Morton J., **Synoptic meteorology and the IGY.** *American Geophysical Union, Geographical Monographs*, No. 2:154–160, **1958.** 4 figs., 10 refs. **DLC**—The importance of the IGY program for synoptic meteorology, which involves the IGY World Weather Map Project, the establishment of the Antarctica Weather Central, the expansion of weather networks in the Southern Hemisphere, and the study of atmospheric circulation at higher levels, to the development of synoptic meteorology is discussed. The predecessors of the World Weather Map Program being carried on during the IGY, the IGY World Weather Map Series, which includes a detailed analysis of both hemispheres and the equatorial regions separately, the role of atmospheric processes at and above 25 km in determining the main atmospheric motions, the jet stream, the construction of meridional sections of the atmosphere during the IGY, etc., are some of the various topics considered. *Subject Headings:* **1. Synoptic meteorology 2. IGY World Weather Map Project.**—*I.L.D.*

11.8–11 550.3:061.3(437) 551.506.22

Pícha, Jan, **Rapport sur la Conférence sur l'Année Géophysique Internationale.** [Report on the International Geophysical Year Conference.] *Studia Geophysica et Geodaetica*, Prague, 2(4):409–410, **1958.** **DWB**—The committee on IGY of the Czechoslovak Academy of Sciences held a meeting May 26–28, 1958 to review the accomplishments of the Czechoslovak program. A list of the reports delivered with the names of the individuals giving them is presented. Among the resolutions taken was one recommending the extension of the activities of the IGY with certain activities being restricted to an additional six months. *Subject Headings:* **1. Czechoslovak participation in IGY 2. IGY program.**—*I.L.D.*

11.8–12 91.04(988):551.32

Finsterwalder, Richard (*Technische Hochschule, Munich*), **Expédition Glaciologique Internationale au Groenland 1957–60 (E.G.I.G.).** [International Glaciological Expedition to Greenland 1957–60.] *Journal of Glaciology*, London, 3(26):542–546, Oct. **1959.** fig., 13 refs. English, French and German summaries p. 542. **DWB, DLC**—Detailed account of the work to be undertaken by the International Glaciological Expedition to Greenland during 1959, together with brief notes on the previous researches which have led up to this work. *Subject Headings:* **1. International Glaciological Expedition to Greenland (IGEG), 1957–60 2. Glaciological expeditions.**—*Author's abstract.*

11.8–13 91.04(99) 551.5:551.46(99)

Burkhanov, V. F., **Report of the research work in the Antarctic during the season of 1955–1956.** (In: Akademiia Nauk SSSR. Mezhduvedomstvennyĭ Komitet po Provedeniiu MGG, **Accounts and materials of the Complex Antarctic Expedition of the USSR Academy of Sciences.** Issued Moscow, **1956.** p. 1–31.) **DWB** (919.9 1613ac)—Systematic meteorological and oceanographic observations made during the complex USSR expedition to the Antarctic in 1955–56 are reported. During the voyage, meteorological reports were exchanged with the meteorological centers of South Africa, Australia, New Zealand, the Antarctic stations of Mawson, Adélie Land, the U. S. A. and with the island stations on Macquarie Island, Kerguelen Island and New Amsterdam. The expedition also exchanged other scientific information on problems of biological surveys, geological, glaciological and ionospheric investigations. Details are given. *Subject Headings:* **1. Soviet Antarctic expeditions 2. Antarctica.**—*N.N.*

11.8–14 551.5(99):(08)

Kraus, E. B., **Antarctic meteorology.** *Nature*, London, 183(4674):1503–1504, May 30, **1959. DWB, DLC**—A resume of the Symposium on Antarctic Meteorology held in Melbourne Feb. 18–25, 1959 is given. The following subjects were discussed at the sessions: the local effects of katabatic winds in the Antarctic, synoptic analysis and forecasting, circulation, snow and ice characteristics, heat and mass exchange and climatological aspects. The investigations discussed were undertaken by the U.S.S.R., France, U. S. and Australia. *Subject Headings:* **1. Antarctic meteorology 2. IGY Antarctic program.**—*N.N.*

6. CONFERENCES—SYMPOSIA

See also: **IGY conference** (Pícha), 11.8–11; **Symposium on Antarctic Meteorology, Melbourne** (Kraus), 11.8–14; **U.S.S.R. Hydrological Institute meeting** (Klibashev), 11.8–126; **Conference of directors of estuary stations, U.S.S.R.** (Ovsiannikov), 11.8–127; **Bioclimatological conference, Liblice, 1958** (Krečmer), 11.8–316.

11.8–15 550.3:061.3(45)

Pellisari, Luigi, **Il VII Convegno dell'Associazione Geofisica Italiana.** [7th meeting of the Italian Geophysical Association.] *Rivista di Meteorologia Aeronautica*, Rome, 18(2):98–99, April/June **1958. DLC**—Met Nov. 7–9, 1957, at Rome with Prof. Albert Defant as principal speaker. Papers and discussions are summarized briefly. *Subject Heading:* **1. Italian Geophysical Society meetings.**—*M.R.*

11.8–16 551.5:061.3

Daking, C. W. G., **Third Congress of the World Meteorological Organization.** *Meteorological Magazine*, London, 88(1045):203–206, July **1959. DWB**—The paper briefly reports the proceedings and deliberations of the Congress, held at Geneva at the Palais des Nations from April 1–28, 1959. It was attended by representatives of 88 member states or territories, by observers from two non-member countries, and by representatives of 15 other international organizations. The agenda was dealt with by means of three working committees namely, the Legal and General Committee; the Administration and Finance Committee; and the Technical Programs Committee. The questions considered before these committees are separately sketched. Finally the paper reports the new elections. Mr. Davies was re-

appointed as Secretary General unanimously for the third financial period. *Subject Heading:* **1. WMO conferences.**—*I.S.*

11.8–17 061.3:550.3

Mattern, G., **Die 23. Jahrestagung der Deutschen Geophysikalischen Gesellschaft.** [23rd annual meeting of the German Geophysical Society.] *Umschau*, Frankfurt a.M., 22(50):694, Nov. **1959. DLC**—A brief summary of the proceedings of the 23rd annual meeting of German geophysicists that was held during Oct. 14–16, 1959 at Bad Soden in the Taunus. Some of the 30 papers presented are summarized briefly. These include **"The dynamics of exospheric matter"** by O. Lucke; a mathematical theory for the displacement of the northern point of the so-called cosmic ray equator from 40° to 50° westward with respect to the most northerly point of the geomagnetic equator by C. v. CONSBRUCH; present status of measurements of tides of the solid earth by R. TOMASCHEK; importance of long sea waves arising during microseismic unrest in the earth by K. STROHBACH, etc. *Subject Headings:* **1. Geophysical conferences 2. Exosphere 3. Soden, Germany.**—*I.L.D.* Ⓢ

11.8–18 551.5:061.3(47)

Khmaladze, G. N., **Nauchnaia sessiia v Tbilisskom nauchno-issledovatel'skom gidrometeorologicheskom institute.** [Scientific session at the Tiflis Scientific Hydrometeorological Research Institute.] *Meteorologiia i Gidrologiia*, Leningrad, No. 2:70–71, Feb. **1959.** 4 eqs. **DWB, DLC**—At this meeting, which was held in May 1958, 27 papers were delivered. The titles of the papers and the names of their authors are presented. The papers dealt with temperature distribution and atmospheric circulation over Antarctica, characteristics of the circulation over the Transcaucasus, meteorology and climatology of precipitation in Eastern Georgia, formation of floods on the rivers of Armenia, etc. *Subject Headings:* **1. Meteorological conferences 2. Hydrologic conferences 3. Antarctic circulation 4. Climate of Georgian S.S.R. 5. Flood formation 6. U.S.S.R. 7. Antarctica.**—*I.L.D.*

7. SERVICES—INSTITUTIONS

See also: **Annual report** (Sonnblick-Verein, Vienna), 11.8–2; **Italian Geophysical Association meeting** (Pellisari), 11.8–15; **Third congress of WMO** (Daking), 11.8–16; **German Geophysical Society meeting** (Mattern), 11.8–17; **Tbilisi Hydrometeorological Research Institute session** (Khmaladze), 11.8–18; **List of publications of Israel Met. Service,** 11.8–26; **Design for Aviation Weather System** (U. S. Weather Bureau), 11.8–28; **U.S.S.R. Hydrological Institute meeting** (Klibashev), 11.8–126; **Conference of directors of estuary stations, U.S.S.R.** (Ovsiannikov), 11.8–127; **Hydrology in Bulgaria** (Muranov), 11.8–128; **Synoptic meteorological research by Ukrainian Hydromet. Serv.** (Ponomarenko), 11.8–142; **U. S. Weather Bureau instrumentation** (Rockney), 11.8–148; **Weather radio broadcasts** (U. S. Weather Bureau), 11.8–156.

11.8–19 551.509.5:639.22

Shteĭnfel'd, E., **Opyt gidrometeorologicheskogo obsluzhivaniia putiny u iugo-zapadnykh beregov Sakhalina vesnoĭ 1951 g.** [An experiment of hydrometeorological service for the fishing season on the southwestern shore of Sakhalin in the spring of 1951.] *Meteorologiia i Gidrologiia*, No. 6:19–21, **1952. DLC**—Short range weather forecasting, storm warnings and information on water temperatures were the basic features of the hydrometeorological service for the fishing season. *Subject Headings:* **1. Fisheries weather forecasting 2. Hydrometeorological services 3. Sakhalin, U.S.S.R.**—*N. T. Zikeev.*

11.8–20 551.5:061.1(569.4)

Gilead, M., **The Israeli Meteorological Office, services and installations.** (In: Israel. Meteorological Service, **Book of ten years of the Meteorological Service of Israel.** Tel Aviv, **1958.** p. 5–8. In Hebrew. 5 tables.) **DWB** (M(06) 185se)—The article provides information about the Israeli Meteorological Office, its current activities and future plans. First its purpose and structure are discussed. Then number and types of meteorological stations working under it are described. Meteorological activities like that of making daily weather maps and a number of meteorological observations for the purposes of aviation,

navigation and armed forces, or to meet public requests for such information, are enumerated. Finally, the number of workers is given and the organizational machinery is explained. *Subject Heading:* **1. Israel Meteorological Services.**—*I.S.*

11.8–21 551.501.9(09)(661)

Brouquet-Laglaire, J., **Afrique Occidentale Française 1959. III. Météorologie.** [French West Africa 1959, Pt. 3, Meteorology.] *France. Secrétariat Général à l'Aviation Civile et Commerciale, Revue*, No. 99:45–55, Jan. 15, **1959.** 7 figs. **DLC**—Historical report on the meteorological service in French West Africa. Enumeration of its functions and description of its organization: radio-meteorological transmissions and broadcasts, climatology and statistics, equipment and standardization of the network, etc. *Subject Headings:* **1. Meteorological services 2. French West Africa.**—*A.V.*

11.8–22 551.5:061.6(94)

Australia. Commonwealth Scientific and Industrial Research Organization. Div. of Meteorological Physics, **Annual Report for the Year 1957/1958.** 7 p. 15 refs., Mimeo. [1958]. **DWB** (M(06) A938re)—Australia, the driest continent, lacks adequate water supplies over wide areas. This report reviews what the Division has accomplished to remedy the situation during the stepped-up activity due to the IGY. After a brief summary of staff activities, various aspects of dynamic meteorology, micrometeorology, agricultural meteorology, radiation, ozone, etc. are reported on. Studies have resulted in a marked advance in the theory of fronts which has followed from recognition of the effect of surface friction. As a result, it may be possible to develop a detailed classification of fronts according to the exact pattern of surface isobars. The completion of a factual study of the incidence of Australian tornadoes and their wind speeds is due shortly. Some of the new instruments developed and constructed at the Division's own workshop are: (1) a reliable mechanical harmonic analyzer of the spectra of atmospheric turbulence, (2) a weather-proof highly sensitive radiometer, and (3) a prototype lysimeter. *Subject Headings:* **1. Meteorological research 2. Australia.**—*W.N.*

8. EDUCATION—HISTORY—BIOGRAPHY—BIBLIOGRAPHY

Education

11.8–23 551.5:62:378.4(774)

Jones, David L. and Bellaire, Frank R., **Meteorology.** *Michigan Tecnic*, Ann Arbor, Mich., 76(5):18–19, 58, Feb. **1958.** 2 ports., 2 photos, diagr. **DWB**—Notes on the history of the Meteorology Department and present applications of meteorology to engineering and research at the University of Michigan. Interest in meteorology began in 1850 at the University of Michigan and has continued to this date. *Subject Headings:* **1. Meteorological education 2. Engineering meteorology 3. Michigan University Meteorology Dept.**—*M.R.*

11.8–24 551.586:378.4

Sargent, Fred., II (*Dept. Physiology, Univ. of Ill., Urbana, Ill.*), **Concepts and techniques in bioclimatological training of graduate students.** *International Journal of Bioclimatology and Biometeorology*, Leiden, Holland, Vol. 2 (Pt. 1), **1958.** 7 p. table, 30 eqs. **DWB**—The scope of bioclimatology as an interdisciplinary science is described and the fundamental conceptual and methodological content of a program of training graduate students in bioclimatology are presented. These include the principles of meteorology and climatology, application and interpretation of statistical procedures, cartographic representation, the nature of biological variability under the action of the physical environment, the biological cycle such as diurnal and seasonal rhythms, quantitative bioclimatology involving the partitional heat exchange between an organism and its environment, development of an index for predicting physiological response to climatic conditions, the meaning of the concept "stress," the interaction between organism and climatic environment, various types of meteoropathies, acclimatization and disacclimatization. The contents of a course in experimental human bioclimatology developed at the University of Illinois is outlined. *Subject Heading:* **1. Training in bioclimatology.**—*I.L.D.*

History

11.8–25 551.5:8

Dufour, L., **Les écrivains et la météorologie: Guy de Maupassant.** [Writers and meteorology: Guy de Maupassant.] *Ciel et Terre*, Brussels, 74(1/2):45–47, Jan./Feb. **1958. DWB**—Numerous quotations from GUY DE MAUPASSANT show his keen observations of clouds, fog, etc. and of the feelings which various weather types engender. *Subject Headings:* **1. Meteorology in literature 2. Maupassant, Guy de.**—*M.R.*

Bibliography

See also: **Bibliog. on cosmic radiation** (Peters), 11.8–81; **Climate of Turkmen Republic** (Miagkov), 11.8–295.

11.8–26 551.5:061.1:017(569.4)

Israel. Meteorological Service, **List of publications of the Israel Meteorological Service.** (In Its: **Book of ten years of the Meteorological Service of Israel.** Tel Aviv, **1958.** p. 71–73. In English and Hebrew.) **DWB** (M(06) I85se)—Publications of the Israel Meteorological Service are listed by Series as follows: **Series A: Meteorological Notes,** lists 15 works on various climatological features. **Series B: Observational Data** includes monthly and annual weather reports and annual rainfall and dew summaries. **Series C: Miscellaneous Papers** consists of 10 mimeographed papers on different subjects of meteorological interest. **Series D: Contributions** mentions 11 articles on meteorological subjects which originally appeared in different Israeli journals. The last **Series E: Ketavim Meteorologiim** is in Hebrew and lists 6 works. *Subject Headings:* **1. Israel meteorological service 2. Meteorological publication lists.**—*I.S.*

11.8–27 002

Emlen, John T., Jr. (*Dept. of Zoology, Univ. Wisconsin*), **International clearinghouse.** *Science*, Wash., D. C., 127(3302):819, April 11, **1958. DWB, DLC**—The February 14 issue of Science (127:313, 1958) included a discussion on **Strength through union,** requesting a clearinghouse and coordination center for abstracting, retrieving and translating the vast flood of international scientific publications. The department of zoology, University of Wisconsin, submits this paper in support of such a program and suggests that such a world science literature center could be organized and supervised by the United Nations. *Subject Headings:* **1. Documentation 2. International cooperation in science information.**—*N.N.*

B. APPLICATIONS

1. AERONAUTICS

See also: **Ceiling frequencies, U. S.** (Hunter et al.), 11.8–301.

11.8–28 551.5:656.7

U. S. Weather Bureau, **Design for a modern National Aviation Weather System: a plan for modernizing the National Aviation Weather Service to promote the safety and efficiency of air operations (through FY 1963).** Wash., D. C., U. S. Weather Bureau, March **1958.** 53 p. 6 figs. **DWB**—The administrator of the Civil Aeronautics Administration on January 9, 1958, reemphasized the meteorological services needed for civil aviation. The letter to the Weather Bureau stressed the needs for systematizing the collection and dissemination of in-flight weather information in support of aviation safety, and extending Weather Bureau plans for mechanization to include automatic observing and reporting equipment for the 240 field stations. The letter is included. The material is subdivided into four parts, viz: the situation today; solving the problem; the plan in detail; future responsibilities. *Subject Heading:* **1. Aeronautical meteorological services.**—*N.N.*

11.8–29 551.501:551.509

Austin Company, Cleveland, Ohio, **Proposal for weather observing and forecasting system 433L integration contract.** Issued April 24, **1959.** 60 p. 13 charts (fold.). **DWB**

(M09.3 A935pr)—A description of the basic requirements, theoretical and practical, of a future weather observation system is given. It illustrates a weather system that "can handle the demands of present and future military and civilian air traffic." The main weather scale categories are discussed and much emphasis is laid on the scale relationships of the entire system, a system that will serve an international or global purpose as regards its operation, data transmission and processing, presentation and storage. Suggestions that are intended to solve the specific weather problems of the day are proposed. There are altogether 13 sections that cover proposals on: the system management objectives; the team members; the management organization; personnel; many technical approaches; specific system target dates scheduled; manpower requirements; facilities and others. These are proposals for study. *Subject Heading:* **1. Aeronautical meteorological services.**—*N.N.*

11.8–30 551.510.42:551.575.1:629.139

Duvergé, P., **Brouillards et fumées sur l'aéroport d'Orly.** [Fog and smoke at Orly Airport.] *La Météorologie*, Paris, Ser. 4, No. 55:179–208, July/Sept. **1959.** 11 figs., 3 photos, 5 tables, 15 refs. French, English and Spanish summaries. **DWB**—This study of visibility at Orly Airport which includes a comparison with observations made at Le Bourget and Cormeilles appears to reveal a deterioration of local conditions during the last few years. The author investigates the causes of this phenomenon and establishes the part played by industrial smoke and the resulting pollution. The article contains interesting climatological data relating to fog for the various Parisian airports and more particularly the distribution of fog at Orly according to direction and speed of wind. In order to show the influence of atmospheric pollution on the appearance and frequency of fog, distinction is made between working days and week-ends when industrial activity is slowed down. The diffusion theory is briefly explained; applying the theory of Sutton, the author studies the effect of two smoky factories whose influence appears to be dominant, and tries to measure the smoke constituent in the composition of fogs at Orly and the financial consequences it entails for the Airport and the airlines. From the theoretical point of view, Orly Airport is suited very well for studies on the diffusion process and on the relationships between pollution and the physics of fog. As concerns the practical aspect, the operation of large industrial plants within a radius of 10 km from the airport should be prohibited and those already in existence should be made to adopt effective smoke control measures. *Subject Headings:* **1. Atmospheric pollution—fog formation relationships 2. Sutton's diffusion theory 3. Orly Airport, France 4. Bourget Airport, France.**—*A.V.*

11.8–31 551.509.314:551.509.325:629.139(46)

Medina e Isabel, Mariano and Medina e Isabel, Fernando, **Nieblas en el aeropuerto de Madrid (Barajas).** [Fog at the airport of Madrid (Barajas).] *Revista de Geofisica*, Madrid, 17(65):29–54, Jan./March **1958.** 34 figs. Spanish and English summaries p. 29–30. **DWB**—The authors make a synoptic and statistical study of fog at the Airport of Madrid (Barajas), with emphasis on the statistical study. Their purpose is to contribute to more reliable forecasts of fog at the Airport, with more accurate details on the probabilities either for or against, with a view to foretelling fog formation, dissipation or rising. *Subject Headings:* **1. Synoptic conditions for fog 2. Statistical forecasting of fog 3. Fog forecasting methods 4. Airport visibility 5. Madrid, Spain.**—*Authors' abstract.*

2. AGRICULTURE

See also: **Effect of irrigation upon surface temperature at night** (Matějka), 11.8–223; **Wind tunnel test of shelter hedge** (Tani), 11.8–247; **Hail hazard, Illinois** (Stout et al.), 11.8–281; **Climatic environment of grasslands** (Barnes), 11.8–308; **UV radiation effects on plant growth** (Brodfűhrer), 11.8–314.

11.8–32 551.586:551.524:633.15

Chirkov, Iu. I., **Agrometeorologicheskie pokazateli prirosta kukuruzy.** [Agrometeorological indices of the growth of maize.] *Meteorologiia i Gidrologiia*, Leningrad, No. 12:10–14, Dec. **1958.** fig., 3 tables, 6 refs., eq. **DLC**—In order to establish a thermal index of maize growth the author carried out concomitant observations on agrometeorological conditions

such as air temperature and the linear growth and increase in weight of different varieties of maize. The results of experiments conducted in Moscow Oblast in 1956–1957 when the moisture content of the soil was adequate, i.e., 75–110% of field capacity, are analyzed. Data are presented on the mean daily increase in growth by decades, increase in weight of green mass and dynamics of absolute daily growth of maize, relationship of absolute increase in mass to area of leaf surface and the variation of mean decadal air temperature and relative growth of maize. The linear growth of maize does not have a sufficiently close relationship with the heat regime, and gives almost no indication of the growth of the vegetative mass of the plant. The weight (absolute) increase in the mass does not correspond to the variation in air temperature since it is determined largely by the leaf surface which may vary a hundred fold during vegetation. The relative increase in growth is closely dependent upon the thermal regime when sufficient moisture is present so that this relationship can be used to establish a thermal index for predicting approximately the yield of green mass of maize. This is accomplished by the formula $A = a(1+r)^t$ where A = weight of mass at end of period, a = weight of mass at beginning of period, r = relative growth in per cent per day and t = duration of period in days. The results of computations indicate the adequacy of this formula. *Subject Headings:* **1. Corn growth 2. Agrometeorology 3. Temperature effects on corn 4. Moscow Oblast.**—*I.L.D.*

11.8–33 551.586:551.524.36:633.15

*Kalmykova, V. V., **Kharakteristika agroklimaticheskikh usloviĭ vozdelyvaniia kukuruzy v Primorskom krae.** [Characteristics of the agroclimatic conditions for maize cultivation in the Maritime Territory.] *Dal'nevostochnyĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, No. 6:3–29, pub. Leningrad, **1958.** 4 figs., 10 tables, charts, 10 refs. **DWB** — A comprehensive study of the heat and moisture requirements of maize in the Maritime Territory of the USSR and the regional distribution of suitable climatic conditions for maize cultivation within this territory. Data are presented on the temperature sums corresponding to the developmental stages of various maize varieties, the mean annual duration of periods with temperatures above +10°C and mean long period sums of temperature above +10°C for districts in the Maritime Territory, mean long period temperature sums for the period with temperature above 10°C required for the attainment of individual phases of maize development at heights above sea level, monthly mean totals of snowfall and hydrothermal coefficients for different periods; mean values of the hydrothermal coefficient for the period June–August, thermal conditions for the growth of maize in the Maritime Territory during the different periods of sowing, etc. The thermal conditions for raising maize for seed are suitable in all of the Maritime Territory where agriculture is practiced. Varieties requiring 2100–2201° for the period with temperatures above 10° are most promising. For the plains near Lake Khanka the most promising varieties are the medium early varieties. The later varieties of maize are provided with heat less than 80% of the time, i.e. their ripening is less than 8 times in a decade. The later varieties requiring up to 2500° can be raised for milk-waxy ripeness in all the regions and those varieties requiring up to 2700° can be raised in Khanka plains. All varieties can be raised for green mass. The thermal requirements for most of the territory, excluding the coastal and some mountain areas, permits sowing of maize as early as May 15, since it must be raised in a very short time. Maize for silos can be sown during May 25–June 10 and the late varieties should be sown at the same time as varieties sown for grain. No moisture deficiencies for raising maize have been observed in the Maritime Territory. *Subject Headings.* **1. Temperature effects on corn 2. Corn 3. Maritime Territory, U.S.S.R.**—*I.L.D.*

11.8–34 551.586:633.11

Mel', M. I., **Opyt izucheniia sviazi urozhaĭnosti iarovoĭ pshenitsy s klimaticheskimi usloviiami mesta vozdelyvaniia.** [Attempt at a study of the relation between the yield of summer wheat and climatic conditions of the area.] *Leningrad. Nauchno-Issledovatel'skiĭ Institut Aeroklimatologii, Trudy*, No. 6:52–63, **1958.** 4 figs., 5 tables, 14 refs. **DWB** —In this study of the effect of climatic conditions upon the yield of summer wheat in European U.S.S.R. statistical data of mean yields for administrative districts and meteorological data for 523 stations for the same period were used. The heat factor was represented by the mean air temperature for the main growth period of summer wheat (May–July) and the moisture factor

by the hydrothermal coefficient during the same period and the total precipitation for Oct.–July. The contents of this study include a description of the method of investigation and an analysis with the aid of data presented in graphs and tables, of the relationship of the yield of summer wheat and the hydrothermal coefficient, the mean air temperature during the main vegetation period (May–July), and the amount of precipitation (October–July). A somewhat better relationship was found to exist between the yields of summer wheat and the amount of precipitation for Oct.–July than between the yields of summer wheat and the hydrothermal coefficient for November–June and May–July. The relationship between yields of summer wheat with the amount of precipitation during October–July in European U.S.S.R. has a regional character. The correlation coefficient between yields and precipitation in the humid forest zone is +0.21 and in the dry zone +0.77. The yield of summer wheat increases with the increase in precipitation regularly up to an optimum and then begins to diminish. In the dry zone of European U.S.S.R. the optimum of the precipitation total for Oct.–July is 475 mm. The relationship between yield and mean air temperature during May–July showed that the best mean air temperature for good wheat yields is 17–18°C. A map of the computed yield of summer wheat in European U.S.S.R. is presented. *Subject Headings:* **1. Wheat 2. Agroclimatology 3. Agroclimatic data 4. U.S.S.R.**—*I.L.D.*

11.8–35 551.586:582.998

Smirnova, V. A., **Opyt izucheniia sviazi urozhaĭnosti podsolnechnika s klimaticheskimi usloviiami mesta vozdelyvaniia.** [Attempt at a study of the relation between sunflower yield and the climatic conditions of the area.] *Leningrad. Nauchno-Issledovatel'skiĭ Institut Aeroklimatologii, Trudy*, No. 6:79–91, **1958.** 5 figs. (1 fold.), 2 tables, 11 refs., 4 eqs. **DWB**—An attempt is made to establish a relationship between the yield of sunflower with heat and moisture and to evaluate agrometeorologically the parts of the country (U.S.S.R.) suitable for its cultivation. Two methods have been used to carry out this analysis. In one a relationship is established between the yield of sunflower and the mean daily air temperature for three months and the G. T. Selianinov hydrothermal coefficient for the same period (total precipitation divided by the sum of temperature reduced 10 times). The second method involves establishing a relationship between the yield of sunflower and the mean daily air temperature during the three summer months (July–August–September) but the moisture index is the total precipitation for the period October–August, i.e. the total precipitation falling during the period of vegetation and the entire preceding cold period. The index of yield was the statistical data by administrative districts and regions. The methods and results of analysis are presented and discussed with the aid of graphs. In establishing a relationship between the yield of sunflowers and meteorological conditions the index of moisture represented by the amount of precipitation during the vegetation period and during the total preceding cold period is superior to the hydrothermal coefficient for the three summer months. The method of relating sunflower yield to temperature and precipitation can be used for comparative evaluation of the zonal yield differences over the U.S.S.R. and for computing the mean yield for large administrative units. The level of heat, i.e. in a given case the mean air temperature during the three summer months of sunflower growth, does not have the same form of relationship for the entire U.S.S.R. The optimum temperature for sunflower is the mean air temperature for June–August: 21.5°C. The yield has a wider relationship with precipitation for the period October–August. Relatively higher yields, usually above 10 centner/hectare are obtained usually in those regions where more than 500 mm of precipitation fall during the period Oct.–August and the mean air temperature for the three month summer period is not less than 19°C. When the temperature for these months is less than 19°C then the yield does not exceed 10 centner/hectare even under good moisture conditions and when it is 17°C it is less than 5 centner/hectare. In districts with precipitation less than 300 mm the yield does not exceed 5 centner/hectare even under optimum moisture conditions. *Subject Headings:* **1. Sunflower yield 2. Sunflower cultivation 3 Agrometeorology 4 U.S.S.R.**—*I.L.D.*

11.8–36 551.586:634.3

Monselise, S. P., and Turrell, F. M. (*Hebrew Univ. Rehovot, Israel, and U. of Calif. Citrus Experiment Station, Riverside*), **Tenderness, climate, and citrus fruit.** *Science*, Wash., D. C., 129(3349):639–640, March 6, **1959.** fig., 4 refs. **DLC**—Tenderness of coastal-grown citrus

fruit to fumigation, spray, and storage practices, and to frost, as compared with fruit grown in the drier interior districts of southern California, is correlated with lower puncture-pressures and higher moisture content of peel. The hardening effect of moisture stress is also exhibited by fruit from tree tops. *Subject Headings:* **1. Citrus orchards 2. California.**—*Authors' abstract.*

11.8–37 551.586:633.73

†Alègre, G., **Climats et caféiers d'Arabie.** [Climates and *coffea arabica* trees.] *L'Agronomie Tropicale*, Nogent-sur-Marne, 14(1):23–58, Jan./Feb. **1959.** 17 figs., 25 refs. French, English and Spanish summaries p. 57–58. **DLC**—*Coffea arabica*, native to the highlands of Abyssinia, requires, in order to thrive in the best conditions, tropical rains distributed over two seasons, reaching yearly from 1200 to 1600 mm, and with rainfall in the driest month over 100 mm. An average yearly temperature of about 20°C, fluctuating during the year between 18°C and 21°C seems to be ideal. The average yearly optimum relative humidity is between 70 and 80%. Luminosity should be rather high during the dry season. These climatic conditions are found together, in tropical countries with climate type A according to KÖPPEN, only above a certain altitude. In Africa, in the equatorial area, one has to go higher than 1.500 m to get a sufficient fall of temperature and pass from climate A to climate C (mesothermical or high land tropical). High altitude is not so necessary when latitude rises. Owing to optimum climatic conditions and taking into consideration coffee arabica's tolerance of some climatic factors and some cultural methods like irrigation and cover-crops, one can overcome this typical climate. It has been ascertained that temperature above 23°C or below 16°C during too long a period of time is harmful to coffee trees. Vegetation stops under 12–10°C. Finally, minimum temperature should not be too close to freezing, as this factor causes great damage to coffee plantations. *Subject Headings:* **1. Agricultural meteorology 2. Climatic effects on coffee trees 3. Coffee cultivation 4. Abyssinia.**—*Author's abstract.*

3. FORESTRY

See also: **Thermal and water balance of young pine forest** (Rauner), 11.8–212; **Interception of precipitation by vegetation** (Wind), 11.8–273; **Timber line, Mt. Fuji** (Sekiya), 11.8–289.

11.8–38 551.588.6:551.579.5

Hartmann, F. K., **Abwasserverrieselung im Waldgelände der nordwestlichen Senne.** [Waste water infiltration in the forest area of the Northwestern Senne.] *Arbeitskreis "Wald und Wasser," Mitteilungen*, Koblenz, No. 3:13–31, **1959.** tables. **DWB** (M:634.9 A664mi)—The organization and procedure of the method of waste water disposal by the Condetta firm of Halle in Westphalia, a candy and chocolate manufacturing concern, is described in detail. The contents of this paper comprise the following: preliminary studies on the effect of infiltration of waste water in the forest as indicated by vegetation, composition of plant species, etc.; method of determining the condition of the forest area by control and experimental areas; the geological and soil conditions of the forest area; the climatic characteristics of the forest area being investigated including mean monthly, annual and seasonal precipitation tables for 1891–1930, monthly and annual mean and annual variation of air temperature for 1891–1930; the water consumption of individual species of trees and irrigation procedure; chemical composition of waste water and of irrigation water, etc. *Subject Headings:* **1. Water supply for forests 2. Forest climatology data.**—*I.L.D.*

11.8–39 551.588.6:551.577:551.579:551.573

Lambor, J., **Liefert der Wald Wasser?** [Does a forest yield water?] *Arbeitskreis "Wald und Wasser," Mitteilungen*, Koblenz, No. 3:32–37, **1959.** 2 figs., table. **DWB** (M:634.9 A664mi)—The problem of the direct influence of the forest upon transpiration and evaporation and hence the role of forests in the water balance of large areas is discussed. Specifically this problem is relevant to the transformation of young forests into old forests in the source areas of rivers and the resulting effect upon river discharge. With the aid of the water balance equation $p=H+V$ (p=precipitation, H=runoff, V=evapotranspiration) it has been shown

in studies in mountain forests that the forest is actually a producer of water and, that depending upon its structure, it can produce more or less water. The intensification of forestry in mountain regions can increase the water flow in streams instead of diminishing it in spite of increasing transpiration and evaporation. This is the result of the fact that a structural change in the forest influences the precipitation and thereby the value p in the balance equation. Precipitation includes non-measured horizontal precipitants such as dew, rime, hoar frost, fog and underground condensation so that they do not constitute part of the balance equation. Dense forests of heterogeneous structure and rich plant cover remove much more moisture from fog passing over them than sparse forests; this is particularly true in mountains. A well tended dense forest increases transpiration and evaporation by pumping more water from the soil than a sparse and thin forest, not at the expense of discharge as in lowlands since as a result of increase of precipitation, the discharge also increases in spite of increased evaporation. *Subject Heading:* **1. Forest influences on water regime.**—*I.L.D.*

11.8–40 551.588.6:551.579

Klotz, K., **Die forstwirtschaftlichen Massnahmen zur Sicherung und Verbesserung der Wasserwirtschaft im Einzugsgebiet des Schwarzen Regen.** [Forestry measures for securing and improving the water economy in the catchment area of Schwarzer Regen River.] *Arbeitskreis "Wald und Wasser," Mitteilungen*, Koblenz, No. 3:62–69, **1959.** 6 photos. **DWB** (M:634.9 A664mi)—The climatological, hydrological and geological characteristics of the catchment basin of the Schwarzer Regen River are described. The water regime is controlled by interception, evaporation, transpiration, and surface runoff. Every growth region has its own characteristics requiring special forest and water regulation measures. The plateau and upper slopes can be the main water storage for the entire landscape. The slopes are the water conducting system in whose continuous water movement the melt water of the plateau and upper slopes slowly trickles down to the valley and supplies the streams and brooks of the catchment basin. The valleys constitute a kind of equalization region and contribute to the damping of high water peaks. In the case of plateaus water regulation involves special measures of forest protection and conservation. Means for maintaining raw humus are discussed. The maintenance of the continuous water passage along the slopes is the principal task of forestry, on the extensive slope. This involves avoidance of clearings and too rapid border cutting, cultivation of mixed stands, etc. In the valleys the water stagnates and aeration is reduced so that swamps and marshes are formed. The planting of firs is suggested since with their deep penetrating roots they are capable of opening up and aerating the marshy soil. The technical measures for furthering the water regime in the forests is discussed. *Subject Headings:* **1. Forest influences on water regime 2. Regen River.**—*I.L.D.*

11.8–41 551.588.6:551.571.4:551.573

†Bashtan, N. S., **Vlagooborot lesnoĭ zony Evropeĭskoĭ territorii Soiuza.** [Moisture exchange in the forest zone of European U.S.S.R.] *Leningrad. Universitet, Uchenye Zapiski* (*Ser. Geograficheskikh Nauk, No. 13*), No. 269:50–64, **1959.** 5 tables, 23 refs. **DLC**—The characteristics of the moisture exchange of the forest zone of the U.S.S.R. were investigated since various contradictory opinions are often expressed in connection with the influence of forest upon precipitation. The area investigated was bounded to the south by parallel 54°30′S lat., to the north by 64°00′N lat., to the west by 29°00′E long., and to the east by 60°00′E long.; the area covered was 1,840,754 km². The moisture exchange of the forest zone of the European U.S.S.R. was studied by the method proposed by O. A. Drozdov. Data are presented on the annual variations of the components of moisture exchange and their characteristics for the forest zone of the European territory of the U.S.S.R. including the moisture transport, transport effectiveness, coefficient of moisture exchange, precipitation, advective and local precipitation, etc; annual distribution of long period values of temperature and wind velocity at the surface of the earth in the forest zone of the European part of the U.S.S.R., increased amount of precipitation in the forest zone of the European territory of the U.S.S.R. as a result of evaporation, annual variation of relative humidity and annual variation of the relative characteristics of precipitation and intensities of circulation of the atmosphere. The results of the computations of the moisture exchange components of the forest zone of the European U.S.S.R. indicate that the role of local evaporation in the formation of precipitation

of the territory studied is extremely slight and the effect of evaporation can be neglected in the execution of reclamation projects in the forest zone. *Subject Headings:* **1. Moisture exchange 2. Forest climatology data 3. European U.S.S.R.**—*I.L.D.*

4. MEDICINE

See: **Tornado as epidemiological research tool** (Manos), 11.8–205.

5. RADIOACTIVITY

See also: **Radioactive contamination of water** (Hinzpeter), 11.8–274; **Carbon-14 activity in past 5000 years** (Crowe), 11.8–304.

11.8–42 551.510.71:546.296

†Jacobi, W.; Schraub, A.; Aurand, K. and Muth, H., **Über das Verhalten der Zerfallsprodukte des Radons in der Atmosphäre.** [Behavior of decay products of radon in the atmosphere.] *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M.,31(3/4): 244–257, **1959.** 12 figs., 22 refs. German, English and French summaries p. 244. **DWB, DLC**—A study was undertaken of the size distribution of the natural radioactive aerosol in the atmosphere by a method developed by one of the authors. Simultaneously, measurements were made in various characteristic locations of the radon concentration and of the concentration of the short-lived decay products in the air in order to measure deviations from radioactive equilibrium. The starting point for these investigations was the radiation-biological importance of these questions for estimates of the natural radiation stress on the respiratory tract and of the radiation stress to which personnel in uranium mines and in industries working with radium and uranium is subjected. The measuring methods used are described and the results are discussed. Finally an estimate is made of the elimination of long-lived decay products of Radon (RaD, RaE, and Po). *Subject Headings:* **1. Radon content of atmosphere 2. Radioactive aerosols.**—*Author's summary.*

11.8–43 551.510.7

Steinhauser, Ferdinand (*Zentralanstalt für Met. und Geodynamik, Vienna*), **Ergebnisse von Beobachtungen der Radioaktivität der Luft in Wien.** [Results of observations of atmospheric radioactivity at Vienna.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, Vienna, 11(2):258–278, **1959.** 3 figs., 3 tables, 10 refs. German, English and French summaries p. 258–259. **DWB, DLC**—Preliminary experiments with the recording of temporal variations of natural radioactivity by means of Geiger counters exposed to the open air (without concentrating the radioactive substances) show typical daily variations of radioactivity, and a marked increase of radioactivity during rainfall, particularly during thundershowers. Results of the daily measurement of long-lived radioactive substances of the air in Vienna, by means of a filter method, are given. The most remarkable feature is a continuous increase of the long-lived radioactivity during the past autumn and winter with a simultaneous decrease of the total radioactivity. This may be explained by increasing sedimentation from the stratosphere. Large-scale weather situations and the so-called hot particles may be of importance in this process. The amount of air intake varies considerably with time which has to be allowed for when considering the measured radioactivity. A reduction based upon a uniform volume of air presents certain difficulties. The experiences gained in evaluating these measurements of radioactivity and their conclusions with regard to improving the method are discussed in detail. *Subject Headings:* **1. Radioactive variations 2. Vienna, Austria.**—*Author's abstract.*

11.8–44 551.510.71:546.296

Wilkening, Marvin H. (*New Mexico Inst. of Mining & Technology, Socorro, N. Mex.*), **Daily and annual courses of natural atmospheric radioactivity.** *Journal of Geophysical Research*, Wash., D. C., 64(5):521–526, May **1959.** 4 figs., 2 tables, 11 refs., eqs. **Discussion** by J. R. Philip, in *Ibid.*, 64(12):2468, Dec. **1959. DLC**—Measurements of the radon-decay products in the atmosphere over a 6-year period have been made with a monitor which precipitates fine airborne particulate matter onto a moving metallic tape. A calibration of the

apparatus showed that the mean value for radon content at Socorro, N. Mex., is 2.4×10^{-13} curie/liter, with an average diurnal fluctuation of a factor of 3.1 between maximum and minimum values. The diurnal variation is attributed to the amount of vertical mixing due to eddy diffusion in the lower atmosphere. The gustiness in air motion near the ground is taken as a measure of the mixing that occurs, and it is measured with a hot-wire anemometer. An annual variation in the atmospheric radioactivity is found which gives values during the fall months that are about twice those during the spring. This variation can also be explained in terms of the mixing that occurs at low levels as judged from mean wind-speed data. Values for the coefficient of vertical diffusion are calculated from measurements of the exhalation rate of radon from the ground and the concentration of radon near ground level as determined from the monitor data. The mean value of the height-independent diffusion coefficient is 6.7×10^{4} cm²/sec. Maximum values of as high as 55×10^{4} cm²/sec are found in the late afternoon of the month of April. Minimum values of the order of 2.0×10^{4} cm²/sec are found in the early morning hours in the fall months. *Subject Headings:* **1. Diurnal atmospheric radioactivity variations 2. Radon content of atmosphere.**—*Author's abstract.*

11.8–45 551.510.721:551.594

Israël, H., **Luftelektrische Wirkungen der künstlichen Radioaktivität.** [Effects of artificial radioactivity on atmospheric electricity.] *Zeitschrift für Physik*, Brunswick, 151:35–45, **1958. DLC**—A comparison is made between the ionizing activity of residues from nuclear fission and that of natural ionizers in the atmosphere in order to determine whether the increase of artificial radioactivity resulting from the explosions of atom bombs, has an influence on atmospheric electricity. It has been stated that fallout in the atmosphere has not changed the ratio of atmospheric electricity. Influences on electric field and on the conductivity of the atmosphere near the ground are possible after heavy precipitations. At present there is no constant change in atmospheric electricity by radioactivity in the air. *Subject Headings:* **1. Radioactive fallout effects 2. Atmospheric electricity-radioactive fallout relationships.** —*A.V.*

6. MILITARY SCIENCE

See: **Ballistic meteorology** (Belgium. Force Aérienne), 11.8–7.

C. ASTRONOMY AND ASTROPHYSICS

1. GENERAL

See also: **Practical astronomy** (Schroeder), 11.8–3.

11.8–46 551.5:52

Cehak, K., **Astronomisches für den Meteorologen.** [Astronomy for meteorologists.] *Wetter und Leben*, Vienna, 9(3/5):66–72, **1957.** 6 refs., 2 foot-refs., 2 eqs. **DLC**—Certain problems in meteorology belong to the field of astronomy. These are the sun and time division, refraction and twilight. The author discusses the length of daylight, measurement of civil time, the beginning of the seasons, the size and setting of a star, the causes of the phenomenon of refraction, the refraction equation, the nature of twilight, and its measurement etc. Equations to calculate these various elements are presented. *Subject Heading:* **1. Astronomy in meteorology.**—*I.L.D.*

11.8–47 523.11

Alpher, Ralph A.; Follin, James W. and Herman, Robert C. (*all, Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.*), **Physical conditions in the initial stages of the expanding universe.** *Physical Review*, 92(6):1347–1361, Dec. 15, **1953.** 3 figs., 4 tables, refs., 73 eqs. **DWB**—The detailed nature of the general nonstatic homogeneous isotropic cosmological model as derived from general relativity is discussed for early epochs in the case of a medium consisting of elementary particles and radiation which can undergo interconversion. The question of the validity of the description afforded by this model for the very early

super-hot state is discussed. The present model with matter-radiation interconversion exhibits behavior different from non-interconverting models, principally because of the successive freezing-in or annihilation of various constituent particles as the temperature in the expanding universe decreased with time. The numerical results are unique in that they involve no disposable parameters which would affect the time dependence of pressure, temperature, and density. The study of the elementary particle reactions leads to the time dependence of the proton-neutron concentration ratio, a quantity required in problems of nucleogenesis. This ratio is found to lie in the range $\sim$4.5:1–$\sim$6.0:1 at the onset of nucleogenesis. These results differ from those of HAYASHI mainly as a consequence of the use of a cosmological model with matter-radiation interconversion and of relativistic quantum statistics, as well as a different value of the neutron half-life. *Subject Heading:* **1. Cosmogony.**—*Authors' abstract.*

11.8–48 523.877

De Jager, C. and Neven, L., **Spectroscopic data for 50 model photospheres.** *Belgium. Observatoire Royal, Annales, Ser. 3,* 8(1), **1959.** 85 p. figs., tables, refs., eqs. **DLC**—This investigation contains computations of spectroscopic data for 50 model stellar photospheres in the range of T and g values corresponding to stars of spectral types earlier than about Ko. The models are characterized by a "limb temperature" To ranging from 4,000° to 26,000° and an effective gravity varying from 10 to 10^5; all models have the H/He ratio adopted by VITENSE. The adopted abundances of seven other elements are given. For the model photospheres, first the detailed structure and next weighting functions for five wavelengths are given. Further, the flux in 9 points of the continuous spectrum, the gradients in three spectral regions and the Balmer discontinuities are computed. In Ch. V and VI the authors give the profiles and equivalent widths of Hγ and Hδ and of two lines of ionized helium. Naturally these latter two lines occur only in spectra of high temperature stars. Finally in Ch. VII equivalent widths of 78 lines of neutral helium and of seven other elements are given. For these lines, the mean optical depths of formation in all photospheres are also computed. *Subject Headings.* **1. Stellar photospheres 2. Limb temperatures 3. Spectroscopic data.**—*A. V.* Ⓢ

2. YEARBOOKS

11.8–49 523(058) 551.5(058)

Annuaire Astronomique et Météorologique (Camille Flammarion), [Astronomical and Meteorological Yearbook], Vol. 95, **1959.** Flammarion, Paris, **1959.** 348 p. figs., tables. **DLC** (QB9.A6)—This yearbook is intended for those interested in the questions of the sky and wish to know day by day the foreseeable and observable celestial phenomena within the range of their observation instruments. The chapters are arranged in the customary order, brought up to date for the year 1959 and supplemented by the developments in the most important astronomical fields. The titles of the various chapters are: Calendars, Sun, Planets, Earth, Moon, Comets and Meteors, Stars and Nebulae, Starry sky. The ninth and last chapter, with the title "Physics of the Globe," includes a new chart showing the curves of equal magnetic variation or isogonal lines in France; the magnetic elements at Chambon-la-Foret, the statistics of earthquakes felt in France and recorded throughout the world from October 1, 1957, to September 30, 1958 and the meteorological year 1957 complete this chapter. Then follows a scientific account dealing with Solar activity and mentioning Wolf numbers (1957, mean: 190.2 and 1958, mean: 184.8, both being the highest ever recorded). The yearbook ends with an article on the artificial satellites of the year 1958. *Subject Headings:* **1. Astronomy yearbooks 2. Meteorology yearbooks 3. Geophysics yearbooks.**—*A. V.* Ⓢ

11.8–50 52(058) 551.593.1

*São Paulo, Brazil. Observatorio, **Anuario** [Yearbook], **1957, 1958 and 1959.** pub. [**1956**], **1957** and **1958.** 2 pieces, about 220 p. each. Mostly tables. Numerous charts.—In addition to a calendar, data on the sun and moon, ephemerides, and apparent positions of stars, these yearbooks contain auxiliary tables on atmospheric refraction and its corrections on account of pressure and temperature, and tables of conversion for various units. *Subject Headings:* **1. Astronomy yearbooks 2. Atmospheric refraction.**—*G. T.*

3. INSTRUMENTS

11.8–51 523.164.08

Lequeux, James; Le Roux, Emile and Vinokur, Marc, **L'interféromètre à deux antennes à espacement variable de la Station de Radioastronomie de Nançay.** [The interferometer with two variable spaced antennas at the Nançay Radio Astronomy Station.] *Académie des Sciences, Paris, Comptes Rendus,* 249(5):634–636, Aug. 3, **1959.** 4 figs., 5 refs. **DWB, DLC**—A two-antenna interferometer functioning on 21 cm wavelength, and designed for the study of the distribution of radio source brightness, is in operation at the Nançay Radioastronomical Station. This instrument is composed of two parabolic radio telescopes mounted as an equatorial, displaceable on a 1500 m long railway track oriented East-West. For a given distance between the antennas, the measurement of amplitude and phase of the interference fringe enables one to determine a component of Fourier transform curve of luminance distribution of the radio source observed. The authors describe the principal technical characteristics of this instrument and state its sensitivity. A figure shows the design of this variable-distance interferometer. *Subject Headings:* **1. Variable distance interferometers 2. Radio telescopes 3. Radio astronomy observatories 4. Nançay, France.**—*A. V.* Ⓢ

11.8–52 523.164.08

Marchal, Anatole F., **La Belgique aura bientôt le radio-interféromètre le plus important du monde.** [Belgium will soon be in possession of the largest radio interferometer of the World.] *Industrie,* Brussels, 13(5):316–318, May **1959.** 3 photos. **DLC**—An interferometer of a new design is under construction at Humain-Rochefort (Belgium). It will comprise 48 paraboloids, each 4.32 m in diameter, 32 being in the direction E–W and 16 in the direction N–S. This instrument will allow uninterrupted observation of the Sun; it will perform a continuous sweeping of the solar disk thanks to the phase transformers with which it will be equipped. *Subject Headings:* **1. Radio astronomy 2. Radio interferometers.**—*A. V.* Ⓢ

11.8–53 523.164.08

Mills, B. Y.; Little, A. G.; Sheridan, K. V. et al. (*all, Radiophysics Lab., C.S.I.R.O., Sydney, Australia*), **A high resolution radio telescope for use at 3.5 m.** *Institute of Radio Engineers, N. Y., Proceedings,* 46(1):67–84, Jan. **1958.** 17 figs., 3 tables, 22 refs., 37 eqs. **DLC**—A pencil-beam radio telescope of the cross type is described; it has a beamwidth of 49 minutes of arc and a sensitivity which approaches, under ideal conditions, 2×10^{-25} W m^{-2} $(cps)^{-1}$, that is, about 1/10,000 the flux density of the strongest radio source. To speed the collection of information the beam may be scanned, presenting information on five separate declinations quasisimultaneously. Although it is intended primarily as a survey instrument, strong radio sources may be located with high accuracy; the probable errors in the measured positions of the stronger identified sources average less than a 1-foot arc. Methods of calibrating the flux density and temperature scales are described and some examples are given of the use of the radio telescope. The theory of operation and some of the design factors are discussed and it is concluded that, for a given size of antenna and the best snr on a typical radio source, the wavelength is rather well defined. This optimum generally lies in the range 2 m to 4 m, depending on details of the receiver and antenna design; other factors, however, play an important part in the choice of wavelength. *Subject Heading:* **1. Radio telescopes. I. Slee, O. B.**—*Authors' abstract.*

11.8–54 523.164.08

Jasik, Henry (*Jasik Labs., Westbury, N. Y.*), **A wide-band antenna system for solar noise studies.** *Institute of Radio Engineers, N. Y. Proceedings,* 46(1):135–142, Jan. **1958.** 11 figs. **DLC**—A wide-band antenna system has been developed as part of a sweep frequency spectrum analyzer for solar noise studies in the 100-mc to 600-mc frequency range. The antenna system consists of an equatorially mounted 28-foot paraboloid illuminated by a unique feed combination which operates over the frequency range in three overlapping bands. Development of the antenna system has been carried out with the aid of scale models and two full size systems have been constructed. The resulting antenna has an effective area which is reasonably constant over the entire range before reflection losses are considered. The feed configuration is described and performance characteristics are given. *Subject Headings:* **1. Solar radio noise observation techniques 2. Wide band antenna system.**—*Author's abstract.*

4. SCINTILLATION PHENOMENA

11.8–55 551.593.12:551.551

Elsässer, H., **Die Szintillation der Sterne.** [The twinkling of stars.] *Die Naturwissenschaften*, Berlin, 47(1):6–10, Jan. 15, 1960. 9 figs., table, 18 refs. **DLC**—General survey and discussion of the results obtained during the last years in the study of the twinkling of stars: methods of measurement and reduction; use of the secondary electron multiplier; no agreement concerning the determination of the magnitudes; brightness twinkling: good frequency spectra obtained until 0.1 Hz, but uncertain and disturbed below 0.1 Hz; dependence on the aperture of telescope, the zenith distance and the altitude above sea level from where observations are done. On the Jungfraujoch the deviation σ reaches only 55% of the σ measured at sea level. Interesting information on the directional twinkling as a function of zenith distance was obtained. Discussion of a correlation between brightness and directional twinkling and of Hosfeld's experiment; twinkling and wind speed: Mikesell's diagram, brightness changes for various frequencies and wind force. Correlation is sometimes possible. Discussion of the results obtained at the Boyden Station (March–Sept. 1956) with Danjon's visual method. Author takes into account the influence of the whole atmosphere. The deviation of the refractive index from the mean value reaches 10^{-8} while the temperature variations reach 10^{-2} degree. The lower layers of the atmosphere exert the strongest influence on the directional twinkling, whereas brightness is influenced by the part of the atmosphere comprised between 8 and 12 km. *Subject Headings:* **1. Scintillation 2. Turbulence effects in astronomy 3. Atmospheric optics.**—*A. V.* Ⓢ

11.8–56 551.510.62:551.593.12

†Arsac, J. (*Observatoire de Meudon*), **Sur la scintillation atmosphérique observée en ondes centimétriques.** [Atmospheric scintillation observed in centimeter waves.] *Annales d'Astrophysique*, Paris, 22(5):447–467, **1959.** 8 figs., 17 refs., eqs. French, English and Russian summaries p. 447. **DWB, DLC**—A study is presented on atmospheric scintillation observed on a 3 cm wavelength and on the influence of the heterogeneities of the atmosphere which interfere with electromagnetic wave propagation. Atmospheric heterogeneities are shifted by wind, and this leads to the displacement of energy concentration zones. The author examines successively the effect of a thin heterogeneous layer and the case of parallel disturbing layers. He gives qualitative and quantitative interpretations of the phenomena. He presents a simplified theory using first order developments, of scintillation in a wholly nonhomogeneous atmosphere. The result is in good agreement with experimental results obtained in optics or in centimeter radio waves. It seems that, in the centimeter region, the observed results do not allow to obtain information on the statistical properties of fluctuations of refractive index in the atmosphere. This is not due to the simplifying hypotheses introduced for quicker calculation, but rather to the lack of information on the structure of the atmosphere. It has been supposed that index fluctuations in the atmosphere have the character of a noise with white spectrum and that they are not essentially dependent on altitude or meteorological conditions. This hypothesis might be questioned: the supposition that an aspect of waves with a distribution of sinusoidal character in the wind direction could be observed on certain days, is not absurd. *Subject Headings:* **1. Scintillation 2. Refractive index fluctuations.** —*A. V.* Ⓢ

5. SOLAR PHYSICS

See also: **Radio emissions from sun** (Maxwell), 11.8–77; **Solar radio noise bursts** (Smith et al.), 11.8–78; **Regions of solar noise emission** (Fokker), 11.8–79; **Solar radio noise bursts** (de Groot), 11.8–80; **Solar activity and cosmic ray variations** (Fukushima, Kodama), 11.8–85; **Solar modulation of cosmic radiation** (Lockwood), 11.8–86; **Cosmic ray events associated with solar flares** (Reid, Leinbach), 11.8–88; **Cosmic-ray storms and solar radio outbursts** (Kamiya, Wada), 11.8–89; **Cosmic rays during high solar activity** (Escobar et al.), 11.8–90; **Decrease of cosmic-ray intensity** (Lockwood), 11.8–91; **Decrease in cosmic-ray intensity associated with solar flare** (Chaloupka et al.), 11.8–92; **Solar-terrestrial relationships in biology** (Berg), 11.8–318.

11.8–57 523.72

Voigt, Hans Heinrich, **Moderne Sonnenbeobachtung.** [Modern solar observation.] *Die Naturwissenschaften*, Berlin, 46(6):195–197, March **1959.** 13 refs. **DLC** —Not long ago,

the knowledge of the construction of the solar atmosphere was based on observations between 3500 and 7000 Å. Modern observations are characterized by the progress made in the field of the radiation of infra-red, radio, UV and Röntgen rays. The author gives a short review of his recent researches; he treats of the infrared spectrum and of radio radiation (steady radiation and disturbed radiation) and concludes with the UV and Röntgen fields. *Subject Headings:* **1. Solar radiation 2. Solar atmosphere.**—*A. V.* Ⓢ

11.8–58 551.521.67:523.75

Bierman, L. and Lüst, R., **Radiation and particle precipitation upon the earth from solar flares.** *Institute of Radio Engineers, N. Y., Proceedings*, 47(2):209–210, Feb. **1959.** table, 5 refs. **DLC**—A brief survey of the main features of solar emissions in connection with solar flares is given: ultraviolet and X-ray radiation, corpuscular emission, radio frequency radiation, and relativistic particles. For these different components of nonthermal emissions the energies are estimated and their effects in the ionosphere are briefly discussed. *Subject Headings:* **1. Solar flare emissions 2. Corpuscular radiation.**—*Authors' abstract.* Ⓢ

11.8–59 523.743:778.3

de Jager, C., **Zonnefotografie van grote hoogte.** [Photography of the sun from great heights.] *Hemel en Dampkring*, The Hague, 57(1):1–8, Jan. **1959.** 7 photos. **DWB, DLC**—Description of three trials made to improve the photography of the solar granulation: 1) from the observatory on the Pic du Midi, at an altitude of 2.900 m, known for its stable atmosphere; 2) from a manned balloon at 6.5 km altitude, and 3) from a unmanned balloon at 25 km height. Only the last attempt gave satisfaction, although even at this height, part of the photo is slightly hazy. *Subject Headings:* **1. Solar granulation 2. Solar photography 3. Balloon photography 4. Pic du Midi Observatory, France.**—*A. V.* Ⓢ

11.8–60 523.74/75

Koeckelenberg, A., **Activité solaire en 1957.** [Solar activity during 1957.] *Ciel et Terre*, Brussels, 75(1/2):34–43, Jan./Feb. **1959.** 2 figs., plate, 6 tables, ref. **DLC**—This article is composed of 3 parts: sunspots in 1957, chromosphere and prominences, and rapid transmission of observations. Systematic observation of sunspots was carried out in the course of 1957 at the Royal Observatory of Belgium. The various data collected during each of the solar rotations and relating to the number of groups, the sunspot number, Wolf's relative local number, etc., are presented in tables. A table gives Wolf's relative daily local number; other tables supply information on the number of eruptions of various types, the number of luminous upheavals, both on rim and disk, dark upheavals on the disk, eruptive prominences, sudden vanishings and active filaments observed at Uccle during the year 1957. *Subject Headings:* **1. Sunspots 2. Chromosphere 3. Solar prominences 4. Uccle, Belgium.**—*A. V.* Ⓢ

11.8–61 523.74/75

Martres, Marie-Josèphe (*Observatoire de Meudon*), **L'activité solaire.** [Solar activity.] *L'Astronomie*, Paris, 73(1):26–27, Jan. **1959.** fig., table. **DLC**—Comments relating to the provisional synoptic charts of the chromosphere and spots published in the review "L'Astronomie" ("Astronomy"). The author supplies information about the system of co-ordinates, the days of observation and the representation of the phenomena. *Subject Headings:* **1. Sunspots 2. Chromosphere 3. Synoptic charts of chromosphere.**—*A. V.* Ⓢ

11.8–62 551.593.7:523.746 551.508.93

Leroy, Jean-Louis, **Polarisation de la lumière des taches solaires.** [Polarization of the light from sunspots.] *Académie des Sciences, Paris, Comptes rendus*, 249(23):2492–2494, Dec. 9, **1959.** 2 refs. **DWB, DLC**—The sunspots emit polarized light in the proportion of several ten thousandths. The light is issued from little extended regions which develop in a complex manner, independently of the position of the spot on the sun; their evolution is connected with the spot's own evolution but it also involves rapid variations. These results are the outcome of measurements made at the Meudon Observatory by means of a very sensitive photoelectric polarimeter. Principal characteristics of the instrument are described.

Subject Headings: **1. Sunspot light polarization 2. Photoelectric polarimeters 3. Meudon, France.**—*A. V.* Ⓢ

11.8–63 551.521.67:551.515.127

†Macdonald, Norman J. and Roberts, Walter Orr, **Further evidence of a solar corpuscular effect on wave disturbances at high altitudes.** *Colorado. Univ. High Altitude Observatory. Institute for Solar-Terrestrial Research, Technical Report,* No. 7, June **1959.** 37 p. 22 figs., 9 tables, 22 refs. **DWB** (M13.1 C719t)—Statistical analyses of the development of troughs in the wave-like disturbances at the 300 mb level for the winter half year of 1958–59 appear to confirm the hypothesis, advanced from our earlier studies, that: troughs appearing over the Gulf of Alaska-Aleutian Island area two to four days after the arrival of solar corpuscular clouds are more likely to become large amplitude troughs than troughs appearing in that area at any other time. In addition we have shown evidence that troughs appearing 3 ± 1 days after a Cp day that continue to remain small are more likely to persist as they move eastward through the western hemisphere than small troughs appearing in the Aleutian-Alaska area at any other time. An extension of the trough analysis to a lower level (500 mb) in the atmosphere suggests that the solar effect can also be found at that 18,000′ level. We now plan to extend the study of trough development over the Western Hemisphere at the 500 mb level for a similar period of high solar activity, during 1946 to 1949. Some speculation has been made about physical mechanisms that might explain the firm statistical results. The difficulties of mathematical model approaches to the problem suggest that experimental methods may offer the best chance for explaining the physics of solar-weather relationships. *Subject Headings:* **1. Corpuscular emissions from sun 2. Solar effects on trough development.**—*Authors' abstract.* Ⓢ

6. ECLIPSES

11.8–64 523.78(468.5)

Houtgast, J., **De expeditie van de Nederlandse eclips-commissie naar de Canarische Eilanden.** [The Netherlands' Eclipse Commission expedition to the Canary Islands.] *Hemel en Dampkring,* The Hague, 57(4):92–95, April **1959.** fig. **DWB, DLC**—The Netherlands will send an expedition to Tarajalejo (Fuerteventura) on the south coast of the Canary Islands to observe the solar eclipse of Oct. 2, 1959. Tarajalejo is situated in the vicinity of the totality belt limit. Purposes and equipment of the expedition are described: 1) a split spectrograph and a newly designed grating spectrograph of great dimensions are used for research of the chromosphere; 2) photographic observations of protuberances; 3) photoelectric determination of the light distribution near the rim of the sun. *Subject Headings:* **1. Solar eclipse, Oct. 1959 2. Eclipse expeditions 3. Tarajalejo, Canary Islands.**—*A. V.* Ⓢ

11.8–65 523.78(468.5)

de Jager, C., **De amateur-eclips-expeditie.** [The amateur eclipse expedition.] *Hemel en Dampkring,* The Hague, 57(4):96–101, April **1959.** 2 figs. **DWB, DLC**—Beside the official expedition, an amateur expedition will observe the solar eclipse at Tarajalejo (Canary Islands). This group will measure light intensity and color of the sickle which is visible just before the totality of the eclipse in order to obtain data on the temperature of the solar photosphere. Because of the location of Tarajalejo, the chromosphere is covered up to 5,000 km in the middle of the eclipse and data may be obtained concerning the height where the corona begins. Attempts will also be made to measure the length of the corona rays. *Subject Headings:* **1. Solar eclipse, Oct. 1959 2. Eclipse expeditions 3. Tarajalejo, Canary Islands.**—*A. V.* Ⓢ

7. PLANETS AND MOON

See also: **Vistas in astronautics** (U. S. Air Force), 11.8–1; **Lunar periodicity** (Korringa), 11.8–319.

11.8–66 523.164.355

Gardner, F. F. and Shain, C. A. (*both, Div. of Radiophysics, C.S.I.R.O., Univ. Grounds, Chippendale*), **Further observations of radio emission from the planet Jupiter.** *Australian*

Journal of Physics, Melbourne, 11(1):55–69, March **1958.** 9 figs., 2 tables, 9 refs. **DLC**—The results of further observation of Jupiter radiation, made near Sydney from June 1955 to March 1956, are presented. Most work was done at 19.6 Mc/s, but some observations were also made at 14 and 27 Mc/s. The characteristics of the 19.6 Mc/s radiation received from Jupiter are described in detail. The new facts disclosed by these observations are: (1) Jupiter radiation appeared to be random noise varying in intensity—large changes in intensity took place in times as short as 0.2 sec, but no shorter; (2) some spaced-receiver observations indicated that the terrestrial ionosphere can have a pronounced effect on the short-term characteristics of the radiation; (3) a single observation showed that on that occasion the radiation was circularly polarized (right-handed in radio sense). There appeared to be three sources of noise on Jupiter. None of these could be identified with visual features. The radiation emitted from the main source was confined to angles within 45° of a central line. The additional observations at 14 and 27 Mc/s showed that the peak intensity, mean duration, and frequency of occurrence were all greatest at 19.6 Mc/s. Two of the radio sources were active at 19.6 Mc/s but not at 27 Mc/s. The angular spread of the radiation from the principal source was considerably narrower at 27 Mc/s than at 19.6 Mc/s. The great variability and spectral concentration of the Jupiter radiation, both resembling solar noise, suggest an origin in some form of plasma oscillation in an ionized region with a critical frequency around 20 Mc/s. *Subject Headings:* **1. Radio emission from planets 2. Radio astronomy 3. Jupiter.**—*Authors' abstract.*

11.8–67 523.45

Van-Allen-Gürtel auch um den Jupiter? [Van Allen Belt also around Jupiter?] *Umschau*, Frankfurt a.M., 59(21):663–664, Nov. 1, **1959. DLC**—The planet Jupiter is a source of irregular radio frequency radiation in the meter wave region and the intensity of this radiation decreases rapidly toward the short wave region. Jupiter also yields thermal radiation corresponding to 120°K. Recent measurements reported by DRAKE gave the following values:

Wave length	Temperature
3.75 cm	210K°
10 cm	600°K
22 cm	3,000°K
33 cm	10,000°K

This is non-thermal radiation. This radiation arises in the same manner as in a synchrotron as a result of the acceleration of charged particles in a magnetic field. In order to explain this effect in the case of Jupiter, DRAKE assumes that the planet is surrounded by powerful radiation belts similar to those J. A. VAN ALLEN has discovered for the earth. *Subject Headings:* **1. Van Allen belt 2. Jupiter.**—*I.L.D.* Ⓢ

8. METEORS AND METEORITES

11.8–68 551.501.81:523.53

Weiss, A. A. (*Dept. of Physics, Univ. of Adelaide*), **Theory of the radio-echo meteor height distribution in a non-isothermal atmosphere.** *Australian Journal of Physics*, Melbourne, 12(1):54–64, March **1959.** 5 figs., 9 refs., 21 eqs. **DLC**—The theory of the distribution in height of the echoing points of shower meteors and of sporadic meteors belonging to a homogeneous velocity group, is extended to the case of a model atmosphere in which the scale height is a linear function of height. The mean and the r.m.s. deviation from the mean of the height distribution in this atmosphere are obtained in terms of tabulated functions, and the dependence of these parameters upon the scale height gradient is evaluated. Neither parameter varies strongly with the scale height gradient unless the incident meteors include a large proportion of massive particles. Experimental cut-off and the approximations made in the formulation of the theory limit the accuracy with which atmospheric scale height and density can be determined from observed heights of sporadic meteors. *Subject Headings:* **1. Radio echoes from meteor showers 2. Meteor observation of atmospheric density.**—*Author's abstract.* Ⓢ

11.8–69 523.5

Whipple, Fred L. (*Harvard College Obs., Mass. & Dir. Astrophysical Obs., Smith. Inst.*), **Meteors.** *Smithsonian Contributions to Astrophysics*, Wash., D. C., 1(1):83–86, **1956.** 4 refs. **DLC**—The author outlines the problems confronting the observers of meteors and calls for a study of the relation that exists between the orbits of comets and meteors, the distribution of particle orbits to produce the observed zodiacal light, the nature of the Gegenschein, the development of meteor streams of great diffusion or low population, and a number of problems relating to orbits of comets, meteors, meteorites and asteroids. *Subject Heading:* **1. Meteors.** —*N.N.*

11.8–70 523.5

†Whipple, Fred L., **Meteors.** *Smithsonian Institution, Wash., D. C., Annual Report, 1957.* pub. **1958.** p. 239–260. 8 figs., table, 42 refs., photos. **DWB, DLC**—The author describes the varying sizes of the following meteoritic projectiles: meteoritic dust, telescopic and radio meteors, photographic and visual meteors, fireballs, detonating bolides, meteorite falls and the crater-producing meteorites. They range from minute particles to very large ones. *Subject Heading:* **1. Meteor sizes.**—*N.N.*

11.8–71 523.5:535.35

McCrosky, Richard E. (*Harvard College Obs.*), **The meteor wake.** *Astronomical Journal*, New Haven, Conn., 63(3):97–106, March **1958.** 9 figs., 3 tables, 14 refs., 27 eqs. **DLC**—Observations with the Baker Super-Schmidt meteor camera show that at least one-quarter of all photographic meteors display luminosity in the shutter breaks. This phenomenon, called wake, occurs most frequently in low-velocity meteors. Since meteor trains are most prevalent among high-velocity meteors, it appears that some new mechanism may be responsible for the wake. It is proposed that small particles, fragmented from the meteoroid, decelerate with respect to the parent body and produce luminosity behind the meteor. Fragments of about 10^{-5} grams will reproduce the wake observed in the specific example investigated here. Under such conditions, essentially all of the light of the meteor is produced by the fragments. This mechanism explains the long-known observed high values of the ablation constant, σ. The observed velocity dependence of wake-producing meteors is shown to be consistent with the fragmentation hypothesis if it is assumed that meteors of all velocities produce particles of the same size. *Subject Headings:* **1. Meteor wake spectra 2. Meteor shower particle size.**—*Author's abstract.*

11.8–72 523.5 552.6

Paneth, F. A. (*Univ. of Durham*), **The frequency of meteorite falls throughout the ages.** (In: Beer, Arthur (*ed.*), **Vistas in astronomy.** pub. London, **1955–1956.** Vol. 2:1681–1686. table, 20 refs.) **DLC, DWB** (520.82 B415v)—Various lines of evidence indicate that the frequency of meteorite falls has varied greatly in the course of time. It seems that glass meteorites fell on our Earth only during the late Tertiary and early Quaternary; that iron and stone meteorites did not fall before the late Quaternary; that centuries ago the fall of iron meteorites was a much more common phenomenon than to-day; and that even since 1800 meteorite falls have become noticeably rarer. *Subject Headings:* **1. Meteorites 2. History of meteorite falls.**—*Author's abstract.*

11.8–73 523.5(438)

Pokrzynicki, Jerzy, **The Krząd ka meteorite.** *Acta Geophysica Polonica*, Warsaw, 6(1):84–85, **1958. DWB, DLC**—A story about an accidental finding of a meteorite, the "Krząd ka" meteorite in an unpopulated area not far from Sandomierz, Poland. The meteorite is supposed to have fallen in the ice age; it was kept in the collection of Poznań University. According to Prof. Gołąb it was a coarse octahedrite of the Ogg type. It disappeared after the building of Poznań University Geological and Paleontological Institute was destroyed by bombs in 1944. *Subject Headings:* **1. Krząd ka meteorite 2. Poland.**—*A.M.P.*

9. RADIO ASTRONOMY

See also: **Nançay interferometer** (Lequeux et al.), 11.8–51; **Humain-Rochefort interferometer** (Marchal), 11.8–52; **Radio telescope, 3.5 m** (Mills et al.), 11.8–53; **Antenna system for solar noise studies** (Jasik), 11.8–54; **Scintillation in cm waves** (Arsac), 11.8–56; **Radio emission from Jupiter** (Gardner, Shain), 11.8–66; **Radiation from Jupiter in cm range** (Umschau), 11.8–67; **Cosmic ray storms and solar radio outbursts** (Kamiya, Wada), 11.8–89.

11.8–74 523.164.4:523.854

Westerhout, Gart, **The radio galaxy.** *Scientific American*, New York, 201(2):44–51, Aug. **1959.** figs. **DLC, DWB**—Radio astronomical observations show the spiral structure of our galaxy, with outward surging waves of hydrogen. The spiral arms of the nebula have their origin near the center of the Milky Way in the constellation Sagittarius. Interstellar clouds of dust obscure this spiral structure from visual telescopes but not from radio telescopes. Much of the fine structure of the galaxy has been observed and mapped on 21 cm wave length at the Leiden Observatory's 82-foot radio telescope at Dwingelov. Different wave lengths show up different features on radio maps. Details of telescope and records, and explanation of thermal and nonthermal radiation are presented in this article and illustrated. Origin of new stars is also explained from new data. *Subject Headings:* **1. Radio astronomy of galaxy 2. Radio telescopes 3. Galactic structure.**—*M.R.* Ⓢ

11.8–75 523.164.4:523.854

van de Hulst, H. C., **Galactic structure and the 21-centimetre microwave line.** *Endeavour*, London, 18(71):117–124, July **1959.** 6 figs., 17 refs. **DWB, DLC**—A semitechnical review of the unexpected uses of radioastronomy in exploring the nature of our galaxy. The study of the 21-cm line (hydrogen) has proven to be the most productive of knowledge hitherto unpredicted. Study of the 21-cm hydrogen line began in Holland in 1944 when it was still cut off from intercourse with other countries and the universities were disrupted. General principles, techniques of observation, mapping the distribution of atomic hydrogen, future research programs, and expansion near the Galactic Centre are among the subjects treated in this illustrated article. *Subject Headings:* **1. Radio astronomy of galaxy 2. Galactic structure 3. Hydrogen lines.**—*M.R.* Ⓢ

11.8–76 523.854:523.164.4

Bouvier, P., **De la stabilité des amas galactiques en présence de nuages de matière interstellaire.** [Stability of galactic clusters in the presence of interstellar material.] *Geneva. Observatoire, Publications, Ser. A*, No. 56, **1958.** Reprinted from *Archives des Sciences*, Geneva, 10(4):527–544, Oct./Dec. **1957.** fig., 8 refs., 18 eqs. **DLC**—The present work discusses, along the lines initiated by J. B. Bok in an earlier study, the influence of the patchy structure of the interstellar medium pervading the Galaxy. The gravitational action of a large cloud of diffuse matter close to a stellar cluster superimposed as a perturbation on the general field of the Galaxy, may increase the minimum critical density of the cluster by a factor of the order 2 to 10, according to different densities assumed for the cloud. *Subject Headings:* **1. Radio astronomy of galaxy 2. Galactic clusters.**—*Author's abstract.*

11.8–77 523.75:523.164.32

Maxwell, A. (*Harvard Astronomy Station, Ft. Davis, Texas*), **Radio emissions from the sun.** *National Electronics Conference, Chicago, Oct.* 1957, *Proceedings*, Vol. 13:374–376, pub. **1957.** 2 figs., 3 refs. **DWB** (621.38 N277pr)—A brief description of experiments at Fort Davis, Tex. (Harvard Radio Astronomy Station) for recording radio frequency radiation from sun at 100–580 Mc/s. Four distinct types of bursts are noted: 1) long series of short bursts lasting hours or days (usually below 250 Mc/s), coming from solar corona or active sunspot regions; 2) continuum radiation over a wide band, sometimes after great bursts; 3) slow-drift bursts, intense at first and drifting toward lower frequencies, lasting 10 minutes and accompanied by visual flares; 4) fast-drift bursts of a few seconds. Over 9000 fast-drift solar radio bursts were recorded in 14 months, associated with minor solar flares. *Subject Headings:* **1. Solar radio noise bursts 2. Solar flare emissions 3. Fort Davis, Tex.**—*M.R.*

11.8–78 523.164.32

Smith, Alex G.; Carr, T. D. and Perkins, W. H. (*all, Florida Univ., Gainesville*), **Anomalous night-time reception of a major solar radio burst.** *Nature*, London, 183(4661):597–598, Feb. 28, 1959. fig., 3 refs. **DWB**—The University of Florida Radio Observatory had Jupiter under observation on five different receiving arrays the morning hours of March 8, 1958, when at 0235 U.T. a single very intense burst of noise rising slowly and decreasing more slowly over a 2 min period was simultaneously observed on all five channels. Characteristics of a solar burst rather than a Jupiter pulse were identified at sunlit observation sites elsewhere. Hence the major solar burst was propagated somehow far into the earth's dark hemisphere. Position of the celestial bodies concerned is shown in a diagram. *Subject Headings:* **1. Solar radio noise bursts 2. Corpuscular radiation.**—*W.N.* Ⓢ

11.8–79 523.74:523.164.32

Fokker, A. D., **Ruis-actieve gebieden op de zon.** [Regions of noise activity on the sun.] *Hemel en Dampkring*, The Hague, 57(6):139–151, June 1959. 12 figs. **DWB, DLC**—The radio emission on meter wavelengths, with irregularly varying intensity is discussed. The article is greatly based on the radio astronomical observations carried out during the last years at the P.T.T. radio receiving station NERA at Nederhorst den Berg (Netherlands). A description is given of the interferometer used, receiving on 1,18 m wavelength. A study is made of the effect of sunspots on radio storms; the measurement of the polarization of radio emission (linear or elliptic) and the role of magnetic fields in the corona on the circular polarized radio emission. Figures are presented of recordings of radio emission and of clockwise, counter-clockwise and mixed polarization with the corresponding interferometer positions. *Subject Headings:* **1. Solar activity 2. Radio emission from sun 3. Sunspot radio radiation.**—*A.V.* Ⓢ

11.8–80 523.164.82

de Groot, T. (*Univ. Obs. "Sonnenborgh," Utrecht*), **Duration and band-width of short-lived transients in solar noise.** *Nature*, London, 181(4624):1676–1677, June 14, 1958. fig., table, 3 refs. **DWB**—Recent investigation shows that the duration of small bursts in solar radio noise at 40 Mc/s can reach 0.18±0.03 sec, as shown in a histogram. The half power band-widths of small bursts are shown. *Subject Heading:* **1. Solar radio noise bursts.**—*N.N.*

D. OUTER ATMOSPHERE

1. COSMIC RADIATION

See also: **Auroral excitation by cosmic-ray particles** (Parker), 11.8–95.

11.8–81 551.521.64:016

†Peters, B. (*Tata Institute of Fundamental Research, Bombay*), **Cosmic rays.** (In: Condon, E. U. and Odishaw, Hugh, (*eds.*), **Handbook of physics.** N. Y., McGraw-Hill, 1958. Pt. 9:201–244. 38 figs., 17 eqs. Bibliog. p. 243–244.) **DWB** (530 C746ha)—The entire field of cosmic ray research is reviewed and results reported by various authors are presented in numerous diagrams. After a brief history of cosmic ray research the principal cosmic ray phenomena occurring in the atmosphere are outlined. The various cosmic ray components and their properties are then taken up separately in sections on primary particles, their geomagnetic acceleration, intensity and energy spectrum, secondary particles, nuclear collisions, the process of star formation, proton and neutron interactions, the electronic component, altitude variations, underground cosmic radiation, time variations of cosmic ray intensity (periodic and nonperiodic), the origin of cosmic rays, etc. A bibliography of 131 items is added. *Subject Headings:* **1. Cosmic ray research 2. Cosmic ray bibliographies.**—*G.T.*

11.8–82 551.521.64(09)

Peters, B., **Les progrès dans la recherche sur les rayons cosmiques.** [Progress in cosmic ray research.] Reprint from *L'Age Nucléaire*, Strasbourg, No. 9, March/April 1958. 12 p. 7 figs., 2 tables.—In addition to providing an excellent summary of past and present efforts and

achievements in cosmic ray research, this article also takes up some of the challenging and unresolved problems and possibilities arising from different discoveries in this field. The nature of primary particles, their measurement, their chemical composition (and a comparison of this composition with that of the universe), sources, behavior in the atmosphere, possible effect on evolution, variations during geologic time, etc., are discussed, and interesting illustrative material is presented. *Subject Headings:* **1. Progress in cosmic ray research 2. Primary cosmic rays.**—*G.T.*

11.8–83 551.521.64:523.75

Dattner, A. and Venkatesan, D. (*both, Royal Inst. Tech., Stockholm*), **Anisotropies in cosmic radiation.** *Tellus*, Stockholm, 11(2):239–248, May **1959.** 6 figs., 18 refs. **DWB, DLC** –The anisotropy of the cosmic radiation outside the geomagnetic field is discussed and related to various processes in the interplanetary gas. Special attention is given to the effect of the density gradient in the cosmic ray distribution, to the earth's orbital motion and to the motion of the interplanetary gas in the solar system. *Subject Headings:* **1. Primary cosmic rays 2. Cosmic ray anisotropy.**—*Author's abstract.* Ⓢ

11.8–84 551.521.64

Hess, Wilmot N. (*Lawrence Radiation Lab., U. of Calif., Berkeley*), **Van Allen Belt protons from cosmic-ray neutron leakage.** *Physical Review Letters*, N. Y., 3(1):11–13, July **1959.** 2 figs., 11 refs., 10 eqs. Errata in *Ibid.*, 3(3):145, Aug. 1, **1959. DLC**—The calculation of the leakage is presented before the calculation of the equilibrium proton energy spectrum in the inner Van Allen belt. Pending more detailed results this note shows reasonable values of lifetime and flux. *Subject Headings:* **1. Cosmic ray neutrons 2. Protons 3. Van Allen Belt.** —*W.N.* Ⓢ

11.8–85 551.590.21:551.521.64

Fukushima, Shin and Kodama, Masahiro (*Inst. of Physical and Chemical Research*), **Secular variation of cosmic-ray latitude effect.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere and Space Research in Japan*, 13(2):112–119, **1959.** 7 figs., 4 refs. **DLC**—Two latitude surveys for cosmic rays at sea level were carried out along the same route in different years. Solar activities corresponding to the two periods during which the surveys were performed, do not show any remarkable difference. Nevertheless, cosmic rays revealed some variations for primary energy spectrum. It has been suggested from the change in spectrum that there may exist a hysteresis effect in cosmic rays against solar activity. *Subject Headings:* **1. Cosmic ray variations at sea level 2. Solar effects on cosmic rays.**—*Author's abstract.* Ⓢ

11.8–86 551.590.21:551.521.64

†Lockwood, J. A. (*Dept. of Physics, Univ. of New Hampshire*), **On the long-term variation in the cosmic radiation.** *Journal of Geophysical Research*, Wash., D. C., 65(1):19–25, Jan. **1960.** 3 figs., table, 17 refs. **DWB, DLC**—From an analysis of the cosmic-ray intensities recorded at Mt. Washington, Mt. Norikura, and Huancayo from 1954 to 1958, the long-term variation of intensity is interpreted as occurring in several sudden decreases rather than gradually. The largest changes in cosmic-ray intensity, and in the ratios of intensities recorded by the three detectors, followed the occurrence of large Forbush-type decreases. The depressed intensity following the rapid decrease of July 11, 1959, further supports this interpretation. Frequency distributions of the changes in nucleonic intensity from day to day show the importance of the Forbush decreases to the long-term variation. These results are discussed in terms of possible solar modulating mechanisms. *Subject Headings:* **1. Cosmic ray decreases 2. Cosmic ray variations 3. Solar effects on cosmic rays.**—*Author's abstract.* Ⓢ

11.8–87 550.385.1:551.521.64

Kasper, Joseph E. (*Physics Dept., Coe College, Cedar Rapids, Iowa*), **Geomagnetic effects on cosmic radiation for observation points above the earth.** *Journal of Geophysical Research*, Wash., D. C., 65(1):39–53, Jan. **1960.** 11 figs., 8 refs. **DWB, DLC**—The theory of geomag-

netic effects on cosmic radiation is discussed for the case in which the point of observation is above the surface of the earth. Parts of the older geomagnetic theory are readily modifiable for application under the new conditions; the manner in which ordinary Störmer theory and the Lemaître-Vallarta theory of the main cone can be adapted is discussed. However, the simple shadow cones of Schremp appear now in a new light; as the point of observation rises from the earth, the simple shadow effect which exists at the earth makes a smooth transition to a new kind of earth's shadow effect. Associated with this effect are principal shadow cones which are defined by reference to the properties of certain families of trajectories. For observation points above the earth a modification in our view of the penumbral region is required; this is discussed very briefly. Extensive computations of principal shadow cones have been carried out by machine integration of the equations of motion and subsequent abstraction of data from these trajectories. Sample computed cones are given for representative particle rigidities, geomagnetic latitudes, and altitudes of observation. The centered dipole approximation for the magnetic field of the earth is used throughout. *Subject Heading:* **1. Magnetic effects on cosmic rays.**—*Author's abstract.* Ⓢ

11.8–88 551.521.64:523.75

†Reid, George C. and Leinbach, Harold (*both, Geophysical Inst., Univ. of Alaska*), **Low-energy cosmic-ray events associated with solar flares.** *Journal of Geophysical Research,* Wash., D. C., 64(11):1801–1805, Nov. **1959.** table, 22 refs. **DLC**—As a result of the IGY riometer program, it has been found that the measurement of ionospheric absorption in arctic regions is a sensitive method of detecting low-energy cosmic rays associated with solar flares. The normal morphology of these events is described, and details are given of the 24 such events that have been detected in the period from May 1957 through June 1959. Two features have been noted: an apparent asymmetry in the distribution of cosmic-ray-producing flares across the solar disk; a pronounced degree of uniformity in the distribution of the radio-wave absorption over the terrestrial polar cap. These features are discussed, and tentative explanations are suggested. *Subject Headings:* **1. Solar flare effects on cosmic rays 2. Riometer 3. Cosmic ray ionization.**—*Authors' abstract.* Ⓢ

11.8–89 551.521.64:550.385.4:523.164.82

Kamiya, Yoshiko (*Physical Inst., Nagoya Univ.*) and Wada, Masami (*Inst. of Physical and Chemical Research*), **Cosmic-ray storms and solar radio outbursts.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere and Space Research in Japan,* 13(2):105–111, **1959.** 4 figs., 2 tables, 9 refs. **DLC**—Relations between the type of solar radio outburst, cosmic-ray storm and magnetic storm are studied using the data obtained during IGY, and the following results are obtained. 1. Almost all cosmic-ray storms are associated with Type IV solar radio outbursts. 2. The other types of outbursts are not related to cosmic ray storms. 3. The size of a cosmic-ray storm is independent of the meridian distance of the radio outburst, but that of a magnetic storm depends on it. From these results, it can be concluded that a large corpuscular cloud with magnetic field is emitted simultaneously with Type IV solar radio outburst occurrence and it has a small core which is the cause of the magnetic storm. *Subject Headings:* **1. Cosmic ray storms 2. Solar radio noise bursts 3. Solar-magnetic relationships.**—*Author's abstract.* Ⓢ

11.8–90 551.590.21:551.521.64:550.385.4

Escobar V., Ismael; Maldonado, E.; Nerurkar, N. W. et al., **Cosmic-ray characteristics registered in Chacaltaya during unusually high solar activity.** *Journal of Geophysical Research,* Wash., D. C., 65(5):1385–1390, May **1960.** 3 figs., 4 refs. **DLC**—Cosmic-ray meson intensity at Chacaltaya (elevation 5220 m, magn. lat. 4°S) registered a 9.5% decrease during three magnetic storms of July 1959. In addition a small increase of 1 to 2% was observed in association with the first and last storms which commenced at Chacaltaya at about noon. These features have been discussed in relation to different magnetic field structures contained in the ionized gas ejected by the sun, and it is shown that the gas had partly turbulent and partly coherent magnetic fields in it when it arrived in the earth's vicinity. *Subject Headings:* **1. Cosmic ray variations 2. Magnetic effects on cosmic rays 3. Solar effects on cosmic rays. I. Romero, R.**—*Author's abstract.* Ⓢ

11.8–91 551.521.64:550.385

†Lockwood, J. A. (*Univ. of New Hampshire*), **Decrease of cosmic-ray intensity on Feb. 11, 1958.** *Journal of Geophysical Research*, Wash., D. C., 65(1):27–37, Jan. **1960.** 9 figs., table, 23 refs., 6 eqs. **DWB, DLC**—An analysis has been made of the cosmic-ray data recorded by the IGY network of stations during the sudden decrease of intensity on Feb. 11, 1958. The unusual rapidity of the decrease, which was followed by a temporary recovery, provides a critical test for existing solar-controlled modulating mechanisms. The main decrease, occurring practically simultaneously over the earth, was relatively energy-insensitive. The subsequent temporary recovery appeared to be associated with a spatial anisotropy. It is suggested that these variations can be interpreted as the result of disordering the outer geomagnetic field by the solar wind, as first pointed out by PARKER. *Subject Headings:* **1. Cosmic ray decreases 2. Solar effects on cosmic rays 3. Solar-magnetic relationships.**—*Author's abstract.* Ⓢ

11.8–92 551.521.64:523.75

Chaloupka, P.; Mokrý, P.; Kowalski, T. et al. (*all, Inst. Physics Czech. Acad. Sciences, Prague*), **A decrease in the intensity of the cosmic radiation observed underground, at sea level and at mountain altitude.** *Nuovo Cimento*, Bologna, Ser. 10, 12(6):639–641, June **1959.** 7 figs., table, ref. **DLC**—A sudden decrease in the penetrating and low-energy components of cosmic radiation was observed at Prague (ground level) at the Lomnitz Peak (2634 m) and at Budapest (18 m below the ground), starting on March 25, 1958. Records of these observations are presented. The decrease was preceded by an extremely bright solar flare which occurred two days earlier. Interesting features of the event were the fact that the decrease included high-energy μ-mesons, and that it was associated with an increase of the amplitude of the daily variation. *Subject Headings:* **1. Solar flare effects on cosmic rays 2. Cosmic ray decreases. I. Sandor, T. II. Somogyi, A. III. Telbisz, F.**—*G.T.* Ⓢ

11.8–93 551.510.53:551.521.64

Alekseeva, K. I.; Brikker, S. I.; Grigorov, N. L. et al. **Izuchenie v stratosfere generatsii π^0-mezonov pri vzaimodeĭstvii protonov i α-chastits kosmicheskikh lucheĭ s iadrami ugleroda.** [Study on the generation of π^0 mesons in the stratosphere during the interaction of cosmic ray protons and α particles with carbon nuclei.] *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, Moscow, 37(3):596–603, Sept. **1959.** 2 figs., table, 10 refs., 2 eqs. English summary p. 603. **DWB.** Transl. into English issued in corresponding number of *Soviet Physics JETP*, N. Y. **DLC**—Pulse ionization chambers and a hodoscope were used in a stratosphere study at geomagnetic latitude of 31°N of the interaction of primary protons and alpha particles with carbon nuclei. The electron cascade produced in lead by γ quanta from decay of neutral π mesons generated in the interaction is investigated. It is found that in the interaction of protons and α particles with carbon nuclei in the 10^{10} eV energy region on the average $(10\pm3)\%$ and $(14\pm10)\%$ respectively of the primary particle energy are spent in π^0 meson generation. *Subject Headings:* **1. Cosmic ray events at high altitude 2. Meson production. I. Murzin, V. S. II. Savin, F. D.**—*Authors' abstract.* Ⓢ

11.8–94 551.521.64

Mishakova, A. P. and Nikol'skiĭ, B. A., **Ob uglovom raspredelenii livnevykh chastits vo vzryvnykh livniakh, vyzvannykh kosmicheskimi chastitsami bol'shikh energii.** [Angular distribution of shower particles in explosion showers produced by high energy cosmic ray particles.] *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, 37(6):1594–1603, **1959.** 4 figs., 3 tables, eqs. English summary p. 1603. **DWB.** For transl. into English, see the corresponding issue of *Soviet Physics JETP*, N. Y.—The angular distribution of shower particles in showers with an energy of 10^{10}–10^{13} eV was investigated in the c.m.s. Experimental and calculated results are presented for the dependence of the number of shower particle pairs on the angle between them. It is concluded that a collision of the primary particle and nucleus leads to a symmetric angular distribution of the shower particles in the c.m.s. and that there is no correlation between the angles of shower particle pairs. *Subject Heading:* **1. Cosmic ray showers.**—*Author's abstract.* Ⓢ

2. AURORAS

See also: **Manual** (U. S. Weather Bureau), 11.8–6.

11.8–95 551.594.51:551.521.64

Parker, E. N., **Auroral phenomena.** *Institute of Radio Engineers, N. Y., Proceedings*, 47(2):239-244, Feb. **1959.** fig., 36 refs., 8 eqs. **DLC** —The aurora is the visible excitation of the gases above the ionosphere by energetic electrons and protons. The auroral patterns are strongly influenced by the geomagnetic field, forming curtains and rays along the magnetic lines of force. The details of the optical excitation in the aurora are very complicated and not well understood. It is clear that both electrons and protons are necessary and that these exciting particles must be accelerated in the vicinity of the earth. We have only rough and untested ideas as to how the protons are accelerated, and why the auroras show a preference for latitude ±65°. We do not understand how and where the electrons are accelerated, or why auroras should have a curtain and ray-like structure, or why the aurora is a night side phenomenon. We wonder to what extent the aurora is associated with the radiation belt around the earth. *Subject Headings:* **1. Auroral physics 2. Auroral-cosmic ray relationships.** —*Author's abstract.* Ⓢ

11.8–96 551.594.51:551.594.12:550.385.4

†Nichols, Benjamin, **Auroral ionization and magnetic disturbances.** *Institute of Radio Engineers, N. Y., Proceedings*, 47(2):245–254, Feb. **1959.** 3 figs., 56 refs. **DLC** —An examination of radio studies of auroral ionization shows that an average ionization density of about 2×10^5 electrons per cm^3 is sufficient to explain the normal radar echo. The magnetic disturbances produced by current systems in the ionosphere are closely related both to the ionization and the luminosity of the aurora. The magnetic variations are also associated with increases in the speeds of motion of the ionization. The increased ionization manifest in the aurora, together with its increased speed of motion, brings about the magnetic changes observed at the ground. The rapid speeds of auroral motions observed both visually and by radio means are at the upper end of a continuous curve of drift motions that increase with increasing magnetic disturbance. *Subject Headings:* **1. Auroral ionization 2. Magnetic storms and auroras 3. Radar echoes from auroras 4. Auroral drift.** —*Author's abstract.* Ⓢ

11.8–97 551.594.52

Evans, S. and Thomas, G. M., **The southern auroral zone in geomagnetic longitude sector 20°E.** *Journal of Geophysical Research*, Wash., D. C., 64(10):1381–1388, Oct. **1959.** figs., 2 tables, 12 refs. **DLC** —Visual auroral observations from the Halley Bay, Shackleton, and Southice, Antarctic bases are tabulated to show how the frequency of occurrence of aurora varied with the geomagnetic latitude, from 63° to 79°, in the sector 20°E during the IGY. The distribution of quiet arcs, and its diurnal variation, are given particular attention. The center of the quiet arc zone is found to be at geomagnetic latitude 71.7°; the interquartile range 2°. *Subject Headings:* **1. Auroral zones 2. Visual observation of auroras 3. Aurora australis.**—*Author's abstract.* Ⓢ

11.8–98 551.594.52:535.24

Duncan, R. A. (*Upper Atm. Sec. C. S. I. R. O., Camden, N.S.W.*), **Photometric observations of subvisual red auroral arcs at middle latitudes.** *Australian Journal of Physics*, Melbourne, 12(2):197–198, June **1959.** 2 figs., 3 refs. **DLC**—The paper contains the first report of the existence of auroral arcs at middle latitudes during the times of only moderate geomagnetic disturbance. Three bright aurorae were observed in southern Australia on July 8–9, Sept. 4–5, and Sept. 25–26, 1958, from the Camden Observatory near Sydney (Geomagnetic latitude 42°). The characteristics of the auroral arcs are given in this communication. *Subject Headings:* **1. Auroral arcs 2. Auroral photometry 3. Subvisual auroras 4. Camden, Australia.**—*N.N.* Ⓢ

11.8–99 551.594.51:535.33

†Wallace, L. (*Yerkes Obs., Univ. Chicago*), **An analysis of a spectrogram of the aurora of Feb. 11, 1958, in the wavelength range 3710–4420 Å.** *Journal of Atmospheric and Terrestrial*

Physics, N. Y., 17(1/2):46–56, Dec. 1959. 4 figs., 2 tables, 36 refs. **DWB, DLC**—A spectrum of the early stages of the great aurora of 11 February, 1958, covering the wavelength range 3710–4420 Å at a dispersion of 22 Å/mm shows several unusual features. The most striking of these are the lines of the $3d-4f$ transition array of N *II* which lie at excitation potentials 4.6 eV above those of the usually observed N *II* lines. The (0,0) and (0,1) bands of the N_2+ first negative system indicate rotational temperatures of from 255°K for the lines with low *K*-numbers, to 575° for high *K*-numbers. The (2,12) and (1,12) Vegard-Kaplan bands of N_2 yield uncertain rotational temperatures with a lower limit of 800°K. *Subject Heading:* **1. Auroral spectra.**—*Author's abstract.* Ⓢ

11.8–100 551.594.5(783)

Roach, Franklin E. and Marovich, E. (*both, Nat. Bu. of Stands., Boulder, Colo.*), **Aurora of Oct. 22/23, 1958, at Rapid City, South Dakota.** *U. S. National Bureau of Standards, Journal of Research, Sec. D*, 64(2):205–209, Mar./April 1960. 8 figs., 12 refs. **DWB, DLC**—During the night of Oct. 22/23, 1958, auroral activity at Rapid City, South Dakota, included (a) a visible aurora in the northern part of the sky; and (b) a "monochromatic" (6300 A) arc through the zenith with an azimuth 12° from east-west (geomagnetic). The intensity changes of the arc were independent of the changes in the visible aurora. It moved slowly southward during the night corresponding to a linear speed of about 8 m per second if its height is 300 m. It is suggested that it is a member of a family of monochromatic arcs which have until recently escaped detection because their red color makes them invisible even though intrinsically intense. *Subject Headings:* **1. Auroral descriptions 2. Auroral arcs 3. Subvisual auroras 4. Rapid City, S. Dak.**—*Author's abstract.* Ⓢ

11.8–101 551.594.51:535.33

Muliarchik, T. M., **Opyt interferometricheskogo issledovaniia emissionnykh linii v poliarnykh siianiiakh.** [Experiment in the interferometric investigations of the emission lines in auroras.] (In: Krasovskiĭ, V. I. (*ed.*), **Spektral'nye, elektrofotometricheskie i radiolokatsionnye issledovaniia poliarnykh siianiĭ i svecheniia nochnogo neba.** Issued Moscow, Akademiia Nauk SSSR, 1959. p. 55–56.)—English transl. by J. Miller issued July 1959, by American Meteorological Society, under Contract AF 19(604)-1936, as its *Transl.* T-RC-14+.—At the Loparskaya station (63°37′N, 126°42′E) the fringes of the oxygen emissions λ5577, 6300 and 8446 Å were obtained. Preliminary estimates of the green line's width give an upper limit for the kinetic temperature of emitting atoms as 400°K. The temperature for the red line is of the order of 1000°K. Indications have been obtained of strong widening of the λ6300 Å line in bright red aurora of A-type. *Subject Headings:* **1. Auroral emissions 2. Loparskaya, Asiatic U.S.S.R.**—*Author's abstract.* Ⓢ

11.8–102 551.521.326:551.594.51:535.33

Shuiskaia, F. K., **Nekotorye rezul'taty spektroskopicheskikh issledovaniĭ poliarnykh siianiĭ i izlucheniia nochnogo neba.** [Some results of the spectroscopic study of aurorae and airglow.] (In: Krasovskiĭ, V. I. (*ed.*), **Spektral'nye, elektrofotometricheskie i radiolokatsionnye issledovaniia poliarnykh siianiĭ i svecheniia nochnogo neba.** Issued Moscow, Akademiia Nauk SSSR, 1959. p. 61–65. fig., 3 tables, 9 refs.) English transl. by J. Miller issued July 1959, by American Meteorological Society, under Contract AF 19(604)-1936, as its *Transl.* T-RC-14+.—Some results of the spectroscopic studies at Roshchino (65°35′N, 116°46′E) are reported. Auroral hydrogen H profile coincides with that obtained at Loparskaya and Zvenigorod. Hydroxyl rotational temperature is equal to 265°±12°K in the zenith and 275°±12°K in the northern direction 20° above the horizon. Some results of treatment of auroral ultraviolet spectra are presented. *Subject Headings:* **1. Auroral spectroscopy 2. Night airglow spectrum 3. Roshchino, Asiatic U.S.S.R.**—*Author's abstract.* Ⓢ

11.8–103 551.594.52:535.33

Hunten, D. M.; Koenig, H. J. and Jones, A. Vallance (*all, Physics Dept. Univ. Saskatchewan, Saskatoon, Canada*), **Rotational structure of the 3914 A. N_2^+ band in sunlit aurorae.** *Nature*, London, 183(4659):453–454, Feb. 14, 1959. fig., 7 refs. **DLC**—Spectrographic analysis of the phenomenon observed on the evenings of Sept. 3 and 4, 1958, showed an unusual

intensity distribution of O, ON_2^+ band structure at 3914 Å represented here in comparison with that of a normal aurora tracing. Two possible mechanisms are discussed to explain the high rotational temperature computed to be 2.100°K. Whether or not this agrees with the atmospheric temperature at the height observed is undecided although it is likely at 300–600 km. *Subject Headings:* **1. Sunlit auroral spectra 2. Auroral spectrography.**—*W.N.* Ⓢ

11.8–104 551.594.51:662.2:539.1(961.3)

Elliot, H. and Quenby, J. J. (*both, Physics Dept. Imperial Coll. of Sci. & Techn. London*), **The Samoan artificial aurora.** *Nature*, London, 183(4664):810, March 21, **1959.** fig., 4 refs. **DWB**—This is a brief note on a recent aurora-like phenomenon SW of Apia, Samoa, suggested to arise from nuclear weapon tests at great height in the neighborhood of Johnston Island some 2000 miles distant. Graphical presentation of calculation by surface-field parameters features very good agreement with observation. For high-latitude explosions, the surface field values are not appropriate. *Subject Headings:* **1. Artificial auroras 2. Nuclear explosion effects 3. Apia, Samoa.**—*W.N.* Ⓢ

3. GEOMAGNETISM

See also: **Geomagnetic effects on cosmic radiation** (Kasper), 11.8–87; **Decrease of cosmic ray intensity** (Lockwood), 11.8–91; **Auroral ionization and magnetic disturbances** (Nichols), 11.8–96.

11.8–105 551.510.535:550.385.36

Zevakina, R. A., **Bukhtoobraznye vozmushcheniia geomagnitnogo polia i sviazannye s nimi izmeneniia v ionosfere po nabliudeniiam v Murmanske.** [Bay-like disturbances of the geomagnetic field and associated changes in the ionosphere according to observations in Murmansk.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 2:304–310, Feb. **1959.** 4 figs. (incl. photos), 4 tables, 13 refs. **DLC**—Bays possess a fully definite diurnal variation. In 1954–1956 positive bays were observed chiefly in the second half of the day—negative in the first. The latter are most frequently observed in summer; the former in winter. Currents producing bay-like disturbances in Murmansk alter their direction about 20.00 h. Up to 20.00 h the current flows from west to east producing positive bays but from 20.00 h it flows from east to west and produces negative bays. "The center of the currents" in most cases (86%) is in northern Murmansk. With increase in solar activity the center of currents is displaced to the south. The majority of bay shaped disturbances was accompanied by anomalous variations in the ionosphere. Most frequently (more than 50%) the bays were accompanied by an increase of the limiting frequencies of Es layer. About 25% of the bays are accompanied by complete absorption of radio waves. With increase of magnetic activity the character of ionospheric variations associated with bay-shaped disturbances varies somewhat and the frequency of anomalous variations in the F2 region increases. The appearance of sporadic Es clouds with high limiting frequencies and complete absorption over Murmansk during bay shaped disturbances indicates the penetration of corpuscular currents overhead. At the same time the center of the source of bay shaped disturbance in most cases is north of Murmansk. *Subject Headings:* **1. Geomagnetic disturbances 2. Magnetic effects on ionosphere 3. Murmansk, U.S.S.R.**—*I.L.D.* Ⓢ

4. IONOSPHERE

See also: **Geomagnetic bay disturbances and changes in the ionosphere** (Zevakina), 11.8–105.

11.8–106 551.510.535:551.594.13

†Nicolet, Marcel (*Ionos. Res. Lab., Penn. State Univ.*), **Collision frequency of electrons in the terrestrial atmosphere.** *Physics of Fluids*, N. Y., 2(2):95–99, March/April **1959.** 2 figs., 3 tables, 13 refs., 6 eqs. **DWB**—An analysis of the collision frequency of electrons in the terrestrial atmosphere has been made using recent experimental and observational data. Application to collisions of electrons with neutral particles and positive ions shows that the electronic collision frequency is due to neutral particles below the peak of the F1 layer and

results from positive ions in the F2 layer. *Subject Heading:* **1. Electron collision frequencies.** —*Author's abstract.* Ⓢ

11.8–107 551.510.535:551.510.62:621.396.11

Vassy, Etienne, **Radionavigation et téléguidage à grande distance.** [Long distance radio navigation and remote control.] *Annales des Télécommunications*, Paris, 14(9/10):256–260, Sept./Oct. **1959.** 5 figs., 5 refs., eqs. **DLC**—Statement of a theoretical method relating to a hyperbolic system working through phase lag, which proves that it is possible to take advantage of the ionosphere provided that the chosen frequencies correspond to a level of the curve $h'f$ where h' is the apparent height or virtual height of the trajectory and f the exploring frequency. The author investigates two cases: that of combined direct and ionospheric waves in the case of Rana (*see: L'Onde Electrique*, Paris, **1955**, p. 319) and that of ionospheric wave only. The choice of the frequencies permitting theoretical functioning of long distance radio navigation is determined, and the disturbing influence of the ionosphere on the phase is examined. The experimental process is described and the results obtained are stated. *Subject Headings:* **1. Radio navigation 2. Ionospheric radio wave propagation.**—*A. V.* Ⓢ

5. ROCKETS AND SATELLITES

See also: **Vistas in astronautics** (U. S. Air Force), 11.8–1.

11.8–108 551.507.362.1:621.396.8

Henry, Dennis G., **The design and performance of quadraloop telemetry and control antennas for the Aerobee Hi and Spaerobee rockets.** New Mexico. State Univ. Physical Science Lab., University Park, New Mexico. Contract AF 19(604)-2188, Scientific Report No. 3, Feb. 22, **1960.** 159 p. 7 figs. plus 136 figs. in appendices—The purpose of this study was to design and develop a type of radiator which gives maximum aft radiation coverage. Both non-flush and flush mounted quadraloops were tested with this objective in mind. The design and performance of non-flush and flush mounted quadraloops for telemetry and command control on the Aerobee Hi and Spaerobee rockets is presented. A detailed radiation pattern study has been made for each type antenna on each missile named. The radiation patterns have been measured for both linear and right circular polarization. Photographs of the antenna tested and the rocket mockup plus a coordinate system showing orientation of antenna are included in this report. Details of both non-flush and flush mounted quadraloops are shown in photographs and drawings. *Subject Heading:* **1. Rocket antennas.**—*Author's abstract.* Ⓢ

11.8–109 629.19:621.455

Sedov, Leonid I. (*Chairman, Commission for Interplanetary Travel, Acad. of Sciences of the U.S.S.R.*) **Orbits of cosmic rockets towards the moon.** *Astronautica Acta*, Vienna, 6(1):16–31, **1960.** 12 figs., table. English, German and French summaries p. 16. **DWB**—Among the various modes of nuclear reactions such as fission, fusion and conversion of matter to radiation only the first named are presently utilizable for atomic rockets. Among the various fission rockets, such as convective, electric, hot water and photonic version, only the first two are presently being industrially developed, but the other two deserve special attention since they are conducive to higher travel performances. *Subject Headings:* **1. Rocket propulsion 2. Interplanetary rocket flights.**—*Author's abstract.* Ⓢ

11.8–110 551.507.362.2:629.19

†Gillespie, Warren, Jr.; Eide, Donald G. and Churgin, Allan B., **Some notes on attitude control of earth satellite vehicles.** *U. S. National Aeronautics and Space Administration Technical Note*, D-40, Dec. **1959.** 80 p. 20 figs., 16 tables, 31 refs., eqs. **DWB** (629.1308 U585tn)—The problem of matching satellite mission stabilization requirements with attitude-control-system capabilities is investigated. The probable civilian missions in an advanced satellite program and a variety of possible satellite stabilization systems are considered. On the basis of this study it appears that most of the mission requirements can be initially met. In particular, an improved version of spin stabilization incorporating earth-horizon scan

units is attractive for meteorological payloads. Attitude-control systems employing radiation-sensing units should be developed. Such systems can be quite versatile in meeting performance requirements with adequate useful life and moderate weight and power. They are also compatible with the launching vehicle guidance capability. *Subject Heading:* **1. Satellite attitude.** —*Authors' abstract.* Ⓢ

E. SOLID EARTH GEOPHYSICS

1. EARTH'S ROTATION

11.8–111 525.3

†Jones, Sir Harold Spencer (*Royal Greenwich Obs., Sussex*), **Non-seasonal changes in the earth's rotation.** (In: Beer, Arthur (*ed.*), **Vistas in astronomy.** pub. London, **1955–1956.** Vol. 2:827–834. 21 refs., eqs.) **DWB, DLC** (520.82 B415v)—The rotation of the Earth is subject to fluctuations which can be interpreted as the combined effect of a slow secular increase, caused by tidal friction in shallow seas, and frequent small random changes. A unique separation between these two effects is not possible. Estimation of the secular increase is made uncertain by the cumulative effect of the random changes. The Earth is subject also to an atmospheric accelerating couple, whose value is smaller than JEFFREYS' estimate of the oceanic retarding couple. The uncertainty of the latter is such, however, that the couples may be equal, the rotation of the Earth being held in synchronization with the atmospheric oscillation. The discordance between the observational ratio of the secular accelerations of Moon and Sun and the theoretical value derived by Jeffreys is removed when the atmospheric accelerating couple is taken into consideration. *Subject Heading:* **1. Rotation of the earth.** —*Author's abstract.*

11.8–112 525.3:551.242:523.74

Danjon, André, **Sur la variation de la rotation de la Terre et sur une cause possible de la variation aléatoire.** [The variation of the earth's rotation and a possible cause of the random variation.] *Académie des Sciences, Paris, Comptes Rendus,* 247(23):2061–2066, Dec. 10, **1958.** 3 figs., 9 refs. **DWB, DLC**—This note deals with: a) the seasonal variation of the earth's rotation; b) its erratic rotation; c) a sudden change of the earth's rotation regime which happened in February 1956 and a possible correlation between this change and the solar activity; d) the relation of L. ESSEN and J. V. L. PARRY's Caesium standard to the Ephemerides Time. *Subject Headings:* **1. Rotation of the earth 2. Solar effects on earth's rotation.** —*A. V.*

11.8–113 525.3

Pacella, G. B., **L'attrito di marea ed il ritardo della rotazione diurna terrestre; esame dell'effetto del ritardo sull'area della superficie terrestre.** [Tidal friction and retardation of the earth's diurnal rotation: analysis of the effect of the retardation upon the surface area of the earth.] *Associazione Geofisica Italiana, 7th, Rome, Nov. 1957. Atti,* pub. Rome, **(1958?).** p. 109–113. 2 figs., 6 refs., eqs. Italian and English summaries, p. 113.—The first part is a recapitulation of what is already known on the subject, with the addition of a calculation of the rotation of the earth assuming that the moon were joined to it. In the second part the surface of the terrestrial ellipsoid immediately after the expulsion of the Moon, and its present surface are computed. The conclusion is that the small increase of the surface cannot have caused large geological results. *Subject Headings:* **1. Rotation of the earth 2. Tidal friction.**—*Author's abstract.*

2. VOLCANOLOGY

See also: **Volcanoes as source of ice nuclei** (Isono et al.), **11.8–258.**

11.8–114 551.21

Pfannenstiel, Max, **Der Ausbruch des Paracutin-Vulkans in Mexico im Jahre 1943.** [The eruption of the Paracutin volcano in Mexico in 1943.] *Naturwissenschaftliche Rundschau,*

8(3):100–103, March 1955. **DWB** –A list of 7 known new volcanoes since 1301 is given, ending with Paracutin on Feb. 20, 1943. Accompanying phenomena are listed and the course of the eruption described. *Subject Heading:* **1. Paracutin eruption.**—*C.E.P.B.*

11.8–115 551.5:551.21

Roberts, W. B., **Some meteorological aspects of volcanoes.** *Australian Meteorological Magazine*, Melbourne, No. 4:34–35, Aug. **1953. DWB** –Thunderstorms, lightning and clouds form over volcanoes; low pressure may trigger volcanoes, dry weather increases activity, wet weather decreases activity. *Subject Heading:* **1. Volcano meteorology.** –*M.R.*

3. SEISMOLOGY

See also: **Yearbook** (Milan Geophysical Observatory), **11.8–144**; **Refraction of microseisms** (Iyer et al.), **11.8–244.**

11.8–116 532.5:550.34

Bäth, Markus (*Seismological Lab., Uppsala, Sweden*), **Seismic surface-wave dispersion: a world-wide survey.** *Geofisica Pura e Applicata*, Milan, 43:131–147, May/Aug. **1959.** 7 figs., 5 tables, 16 refs. English and German summaries p. 131–132. **DWB, DLC**—By means of the long-period records at Uppsala and Kiruna of thirteen specially selected earthquakes, the Love and Rayleigh wave dispersion is determined for all oceans and all continents except for South America. The observations have given information on crustal structure along several paths, not investigated earlier; in other cases, they have confirmed earlier results. The methods are discussed. The results for oceanic areas are summarized in a table. The observations demonstrate the oceanic structure of the central Arctic area as well as the complete similarity of the Atlantic and Pacific bottom structure. Continental dispersion curves are determined for very long paths over Eurasia and for the hitherto longest path over North America as well as for a path crossing Africa. These observations indicate an average crust about 10–15 km thicker along the Eurasiatic path than along the North American path, whereas there is perfect agreement between the North American and the African continent. A shear-wave velocity of 4.3–4.4 km/sec is obtained for the upper part of the mantle under the continents. Further conclusions must await the computation of a greater number of theoretical dispersion curves. *Subject Headings:* **1. Seismic wave dispersion 2. World-wide seismic surveys 3. Oceanic structure 4. Ocean floors.**—*Author's abstract.*

11.8–117 550.340.19(493/675)

†Van Gils, J. M., **La séismologie en Belgique et au Congo Belge du 1954 à 1956.** [Seismology in Belgium and in Belgian Congo, 1954–1956.] *Belgium. Observatoire Royal, Communications*, No. 125, **1958.** 8 p. 28 refs. **DLC** –Description of the equipment and activities of two Belgian seismological stations: one at Ucele, belonging to the Royal Observatory and one at Dourbes under the Center of Terrestrial Physics of the Royal Meteorological Institute. The author gives a survey of seismological activities in Belgian Congo which has two separate networks. *Subject Headings:* **1. Seismological networks 2. Belgium 3. Belgian Congo.**—*A.V.*

11.8–118 550.342:551.515.2

†Das Gupta, Sushil Chandra (*Presidency Coll. Calcutta*), **On the generation of microseisms due to disturbances in deep sea correlating observations at different stations.** *Beiträge zur Geophysik*, Leipzig, 68(4):204–223, **1959.** 2 figs., 2 tables, 26 refs., 42 eqs. English and German summaries p. 204. **DWB, DLC**—In this paper, the possibility of generation of microseisms due to progressive sea waves is discussed. It is assumed, as shown in an earlier paper, that the period of such waves is approximately half the period of sea-waves generating them. The character of microseisms is shown to be approximately of Rayleigh type regarding the phase relation of components. It is demonstrated that the velocity of propagation is much smaller than that of Rayleigh waves and that the velocity depends on the geological structure of the ocean bed. The computed wave length is found to conform to observation. The lack of directional correlation pointed out by Donn is explained. Finally, reference is made to the author's previous paper regarding the explanation of the phenomenon that micro-

seisms are observed in the case of typhoons but not in all cases of approach of monsoons. *Subject Headings:* **1. Microseism-typhoon relationships 2. Microseism theories.**—*Author's summary.*

11.8–119 550.342:550.341.1

Nanney, C. A., **Evidence for correlations between microseisms and earthquakes.** *U. S. Naval Research Laboratory, NRL Report* 5237, Jan. 13, 1959. 21 p. 22 figs., 2 tables, 12 refs. **DWB** (M(055) U586r)—A study was made to determine whether any correlations exist between the occurrence of earthquakes and the properties of microseisms. Correlations were found between (a) microseism frequency and the occurrence of large earthquakes, (b) microseism amplitudes and the occurrence of large and deep earthquakes, (c) smaller shocks and a local increase of microseism amplitudes, (d) long-period (>10 seconds) microseisms and the occurrence of deep earthquakes, and (e) microseism propagation directions and the great circle path to the location of significant earthquakes. The preceding correlations were all found to test significantly at a 0.01 statistical significance level or greater. *Subject Heading:* **1. Microseism-earthquake relationships.**—*Author's abstract.*

11.8–120 550.342:532.593:551.556

Savarenskiĭ, E. F.; Lysenko, L. N. and Kompanets, M. V., **O mikroseĭsmakh ozera Issyk-Kul' po nabliudeniiam seĭsmicheskoĭ stantsii v Rybach'em.** [Microseisms of Issyk-Kul' Lake according to observations by the seismological station in Rybach'e.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 8:1015–1019, 1958. 6 figs., table, 5 refs., 1 eq. **DLC.** Transl. into English in the corresponding issue of the English language ed. of the **Izvestiia,** *Bulletin of the Academy of Sciences of the USSR, Geophysics Ser.*—An attempt is made to explain the mechanism of origin of short period microseisms (1.5–3.0 seconds) whose amplitudes increase during winds over Issyk-Kul'. The standing wave necessary for the manifestation of microseisms on Lake Issyk-Kul' may be the result of southerly or easterly winds of the superposition of traveling wind waves and wind waves reflected from the shores. Approximate values of the azimuth on the microseism source indicate the northern and southern shores as reflection areas and that near these shores the standing waves are most intensely developed. A clear relationship was established between wind development over the lake and amplitude of microseisms. It is shown that the 7–9 hours needed for the formation of a standing wave region commensurate with the given effective reflecting areas of the shores corresponds to the observed retardation of the maximum amplitude of the microseisms in comparison with the wind velocity. The relationship of the period of sea waves and their velocity namely

$$T = \frac{2\pi}{g} C$$

applied to Issyk-Kul' gives a wave period of 1.5 to 3 seconds as compared with the observed period of 1 to 3 seconds. Finally the amplitude of microseisms computed by the Longuet-Higgins formula confirms the hypothesis that the standing waves result from the superposition of traveling waves and waves reflected from the shores. *Subject Headings:* **1. Microseisms from standing waves 2. Issyk-Kul' Lake, U.S.S.R.**—*I.L.D.*

F. OCEANOGRAPHY AND HYDROLOGY

1. OCEANOGRAPHY

See also: **Fisheries service, Sakhalin** (Shteĭnfel'd), 11.8–19; **Tidal friction and earth's rotation** (Pacella), 11.8–113; **Marine hydrometeorological and fishing bulletin** (Lebedev), 11.8–157; **Representativeness of sea temperature data** (Scheli), 11.8–235; **Stratus cloud and sea temperature, Pembroke Dock** (Krill), 11.8–265; **Paleotemperatures and abyssal fauna** (Birstein), 11.8–302; **Lunar periodicity in marine life** (Korringa), 11.8–319.

11.8–121 551.46:061.6(73)

American oceanography survey and proposals for ten-year program made by NAS-NRC Committee. *Science*, Wash., D. C., 129(3348):550–551, Feb. 27, 1959. **DLC**—The state of

American oceanography today and its needs for the future have been assessed by a committee on oceanography of the National Academy of Sciences-National Research Council. It is recommended that the basic research activity during the next ten years be doubled and accompanied by a new program of ocean-wide surveys twice as large as the present one as well as a program of increased activity in applied marine sciences. A note of urgency runs through the committee's report. Need for ships is emphasized. The recommendations call for the construction of 70 ships of 500- to 2200-ton displacement between 1960 and 1970 at a total cost of $213 million. The committee also advocated the broadening of educational opportunities in oceanography for graduate scientists, through action by universities, the Federal Government and the scientific community at large. Such a program would cost $651.5 million and the committee has suggested a funding arrangement based on the relative importance of the program to the various federal agencies. *Subject Heading:* **1. Oceanographic research.**—*I.S.*

11.8–122 551.46

†Hedgpeth, Joel W. (*Scripps Inst. of Oceanog., LaJolla, Calif.*), **Classification of marine environments.** *Geological Society of America, Memoir*, No. 67, Vol. 1:17–28, Dec. **1957.** 5 figs., table, 38 refs. **DLC** (QH542.N3)—The author presents graphically his scheme of classification of marine environments and defines the terms used (which are becoming increasingly complex) as well as can be done in view of time honored ambiguities. A comparative chart from MÜLLER shows terminology for different zones used by 21 authorities from FORBES and HANLEY (1853) to EKMAN (1953), and a graph shows the classification of marine environments on a hypsographic curve. Finally a "climagram" devised by the author, is presented for hydrographic climates (Key West, Fla.), with salinity and temperature as arguments, and monthly values for each station connected to form a polygon. *Subject Headings:* **1. Hydrographic climates 2. Marine environment classifications 3. Marine ecology terminology.**—*M.R.*

11.8–123 551.46(265)

Katō, T., **Analysis of distribution and correlation of water masses in the East China Sea in summers 1954–1956.** *Journal of Meteorological Research*, Tokyo, 10(8):693–697, Aug. **1958.** 13 figs., table. In Japanese. Reprinted as *Oceanography and Meteorology, Nagasaki, Japan*, 9(174), 1959. **DLC**—Many useful observations have been made from charts on the significance of oceanographic elements of the Kuroshio and cold-warm core in the considered area in the summers 1951–1957. Over $\frac{2}{3}$ of the continental shelf is over 100 m deep in the East China Sea. The diffusion equation is not used but clear-cut figures were used to explain the following results: on the relation of cold water masses from the west coast of Korea and continental river water from China by means of accumulated means of water temperature and chlorinity distribution; with the increase of continental river in Ryukyu Islands it flows, making a upper layer of the Kuroshio and becomes a low temperature cold water area. Main Kuroshio current was sought from the upper vertical side, above the value of Cl, 19.00‰ was different both Tsushima warm current that is influenced by the cold water of western coast of Korea. The Kuroshio core in the East China Sea is tended to descend since the maximum period of 1954–1955. *Subject Headings:* **1. Kuroshio current 2. Tsushima current 3. Ocean current investigations 4. China Sea.**—*K. Chung.*

11.8–124 532.59:551.46.018

Whittenburg, C. G.; Huber, E. A. and Newell, G. S. (*all, Control Syst. Lab. Ill. Univ.*), **Instrument for measuring water waves.** *Review of Scientific Instruments*, N. Y., 30(8):674–676, Aug. **1959.** 2 figs. **DWB, DLC**—The variation of wave height is sensed by a probe whose capacitance is linearly dependent on wave height and controls the repetition rate of a blocking oscillator. The variation of repetition interval is converted into amplitude modulation at the recording site. The wide dynamic range (1000:1) of the electronic portion of the instrument permits the measurement of ripples with the same accuracy whether they are on calm or rough water. The dynamic range of the instrument is limited by the characteristics of the probe. The instrument requires no balancing, has a frequency range of 0 to 100 cps and a sensitivity which is adjustable. The maximum sensitivity used in the field was 8.0 v/cm water displacement and the noise level at this sensitivity corresponds to 0.032 mm rms water

displacement. *Subject Headings:* **1. Wave height measurement techniques 2. Wave recorders.**—*Authors' abstract.*

2. SEA ICE

11.8–125 551.326.7:539.42

†Assur, Andrew (*S.I.P.R.E., U. S. Army Corps of Engineers, Wilmette, Ill.*), **Composition of sea ice and its tensile strength.** *National Research Council, Wash., D. C., Publication,* No. 598:106–138, Dec. **1958.** 22 figs., 4 tables, 25 refs., 73 eqs. **DLC, DWB** (551.311 A675pr)—The contention that sea ice is only $\frac{1}{3}$ as strong as fresh-water ice is denied on the basis of experiments on both types of ice, using identical test procedures, and a theory is advanced to account for the spectrum of strength variations in sea ice. The strength of the upper, grayish-white layer of sea ice was found to increase rapidly below −22.9°C, when large quantities of $NaCl \cdot 2H_2$ precipitated, and easily reach or exceed (2–3 times) that of fresh-water ice. The increase in strength was higher for young ice of high salinity than for perennial ice of low salinity. The strength of the middle ice layer at −8.2° to −22.9°C was comparable to that of fresh-water ice. Perennial ice was about $\frac{1}{3}$ stronger above −8.2°C than comparable 1-season ice and retained its strength even above −1.3°C until all salt went into solution. The strength increase of sea ice at low temperatures is attributable to the reinforcement of brine-pocket walls by deposits of precipitated salt particles together with ice below −8.2°C, while the reduction in strength above this temperature could be explained by the action of brine on the ice surface around the brine inclusions. Empirical relations of tensile strength of winter sea ice and perennial ice to the square root of the relative brine volume are derived. *Subject Heading:* **1. Sea ice strength.**—*SIPRE abstract No. 17705.*

3. HYDROLOGY

See also: **Laminar flow theory** (Targ), 11.8–4; **Tiflis Hydrometeorological Research Institute session** (Khmaladze), 11.8–18; **Waste water infiltration NW Senne region** (Hartmann), 11.8–38; **Hydrologic effect of forests** (Lambor), 11.8–39; **Forestry measures to improve water economy** (Klotz), 11.8–40; **Moisture exchange, forest zone of European U.S.S.R.** (Bashtan), 11.8–41; **Rainfall-runoff simulating apparatus** (Zimont), 11.8–152; **Flood-producing rainfall, Spain 1957** (García Miralles, Carrasco Andreu), 11.8–158; **Heat transfer in moist disperse medium** (Deriabin), 11.8–233; **Thermophysical characteristics of soil** (Gorbunova et al.), 11.8–234; **Lake Michigan water temperatures** (Ahrens), 11.8–236; **Storm rainfall and runoff, Chikugo river** (Aki et al.), 11.8–271.

11.8–126 551.579:061.1(47):06.043

Klibashev, K. P., **Sessiia Uchenogo soveta Gosudarstvennogo gidrologicheskogo instituta po itogam nauchno-issledovatel'skikh rabot 1958 g.** [Session of the Scientific Council of the State Hydrological Institute on the results of scientific research in 1958.] *Meteorologiia i Gidrologiia,* Leningrad, No. 5:62–63, May **1959. DWB, DLC**—The plenary session of the Scientific Council of the State Hydrological Institute held a meeting during Jan. 12–17, 1959 to review a large number of research projects carried out in 1958 by the Academy of Sciences of the U.S.S.R., representatives of various academic institutions and local departments of the Hydrometeorological Service. K. P. Voskresenskiĭ reported on a new method of computing the water balance of the stagnant lakes of northern Kazakhstan. P. P. Voronkov presented a new method of studying the hydrochemical regime of the surface waters and results on the basis of field investigations carried out by the State Hydrological Institute in the regions of virgin lands. A. G. Andreianov discussed the intra-annual distribution of runoff on the basis of the equations of water and heat balance. The papers of N. E. Kondrat'ev and I. V. Popov dealt with the computational hydrodynamic methods, with morphological analysis of developmental processes and their application to the investigation of planned deformation of channels, and natural and laboratory studies. A. V. Karaushev by means of turbulent diffusion developed a method for computing ebb and flow phenomena in water reservoirs. P. P. Kuz'min reported on the results of long period studies of formation and distribution of snow cover. M. S. Grushevskiĭ reported on the use of electronic computers in solving problems of river hydrology, etc. *Subject Headings:* **1. Hydrologic research 2. U.S.S.R. State Hydrological Institute 3. U.S.S.R.**—*I.L.D.*

11.8–127 551.46(282.6):061.3

Ovsiannikov, A. N., **Soveshchanie nachal'nikov ust'evykh stantsiĭ.** [Conference of directors of estuary stations.] *Meteorologiia i Gidrologiia*, Leningrad, No. 5: 63, May **1959. DWB, DLC**—During Feb. 23–March 4, 1959 a conference of directors of estuary stations of the Hydrometeorological Service was held in Moscow. During the past several years monographs on the regimes of the estuaries and sea shores of the Volga, Amu Darya, and Kuban were published. The programs of the Riga and Neva estuaries are being completed satisfactorily. The programs of the north Dvina and Don estuaries are still encountering difficulties. I. V. SAMOĬLOV presented a paper on the study of estuaries in the Chinese People's Republic. *Subject Headings:* **1. Estuarine hydrography 2. U.S.S.R.**—*I.L.D.*

11.8–128 551.579:061.1(497.2)(09)

Muranov, A. P., **Gidrologiia v Narodnoĭ Respublike Bolgarii.** [Hydrology in Bulgaria.] *Meteorologiia i Gidrologiia*, Leningrad, No. 5:56–58, May **1959.** 10 refs. **DWB, DLC**—Systematic hydrological observations were begun in Bulgaria only in 1901 when the first station was established on the Black Sea. A hydrological section was established in the Ministry of Agriculture in 1911 but owing to the Balkan War and World War I there was little activity. A considerable expansion of hydrological stations occurred during 1920–1934 in connection with the promulgation of a series of laws regarding the study of water resources, the establishment of water reservoirs for irrigation purposes, etc. In 1924 the first hydrological yearbook was published. During the period 1935–1948 hydrology became established on a solid scientific basis. A hydrological network was set up which, toward the end, included 249 points. Systematic observations on water discharges began to be made and extensive equipment was provided. In 1950 an entire reorganization of the hydrological service took place when the Hydrometeorological Service was set up. The hydrological part includes sections on hydrology, data analysis, and water census. By 1955 the network had increased from 265 to 282 stations and numerous special stations. A special section on the study of underground water has been established. The largest work accomplished hitherto has been the hydrological handbook on the rivers of the Peoples' Republic of Bulgaria (1958). A scientific journal "Khidrologiia i Meteorologiia" is being published since 1952. Scientific research on hydrology is being carried out by the Water Canal Project of the Technical Institute of Bulgarian Academy of Sciences. *Subject Headings:* **1. Hydrologic services 2. History of hydrology 3. Bulgaria.**—*I.L.D.*

11.8–129 551.579.2:551.509.329:627.8

Wöhr, Fritz, **Aus Schneevorratsmessungen abgeleitete Zuflussprognosen zu voralpinen Energiespeichern (erläutert am Beispiel "Walchensee").** [Predicting the flow to the Pre-Alpine hydroelectric reservoirs on the basis of snow storage measurement data (illustrated by the example of Walchensee.] *Germany. Deutscher Wetterdienst, Berichte*, 8(54):155–156, **1959.** 2 figs. German, English and French summaries p. 155. **DWB, DLC**—At present, the operation of large Alpine or Pre-Alpine reservoirs is frequently based on flow predictions deduced from mathematical computations and records. Particularly valuable data are obtained by correlating the early summer runoff serving to fill the reservoir with the snow reserves of the drainage area. These studies require the measuring of snow accumulation. An example for demonstrating the results of these measurements and computations constitutes the Walchensee hydroelectric plant of Bayernwerk, Munich. A summary of its principal technical and hydrological characteristics will be given prior to its visit. *Subject Headings:* **1. Snow melt runoff forecasting 2. Water supply from snow 3. Walchensee, Bavaria.**—*Author's abstract.*

11.8–130 551.579:628.11(477)

Shpak, I. S., **Vodnyĭ balans malogo polevogo vodosbora za zimne-vessenniĭ period.** [The water balance of a small field catchment basin during the autumn-winter period.] *Kiev Ukraine. Ukrainskiĭ, Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ, Institut, Trudy*, No. 19:49–62, **1959.** 3 figs. (1 fold.), 5 tables. **DWB**—The author presents the results of computations of the elements of the water balance of the Opytnyĭ ravine which is a member of the group of experimental catchment basins of the Pridesiansk runoff station. The hydrological

characteristics, soils and meteorological properties of the Opytnyĭ ravine are described and data on the hydrometeorological characteristics are presented in a graph. The components of the water balance during the winter-spring seasons of 1956 and 1957 were investigated by means of the formula $X = Y+Z+P+W+R$, where X = influx of water, Y = runoff, Z = evaporation, P = infiltration in 1.5 meter layer of the soil, W = increase (+) or decrease (−) of moisture reserves in the 1.5 meter soil layer and R = increase (+) or decrease (−) of moisture reserves in ponds and other depressions on the surface of the catchment basin. The methods of determining the individual components are described with the aid of relevant formulas and data are presented on the water balance and its components. The results of the investigation indicate the following, viz.: the coefficients of surface runoff from an even catchment basin during the winter and spring attain considerable magnitude; during the winter-spring period the total reserves in the 1.5 meter layer of the soil vary slightly. The observed moisture variations within the boundaries of individual horizons occur as a result of the transition of moisture from one horizon to another. The infiltration of water into the soil proceeds chiefly in depressions where long stagnation is observed; only in such parts can ground water be supplied. During certain periods in winter, the accumulating capacity of closed depressions in a catchment basin is utilized unevenly as a result of the expenditure of accumulated water for infiltration into the soil. *Subject Headings:* **1. Hydrologic balance of small basins 2. Pridesiansk runoff station, Ukrainian S.S.R.**—*I.L.D.*

11.8–131 628.1:627.81:628.54

Grushko, Ia. M., **Vazhnye voprosy okhrany vodoemov: o normakh dopustimoĭ kontsentratsii vrednykh veshchestv v vode.** [Protection of water reservoirs: permissible concentrations of harmful matter in the water.] *Priroda*, Moscow, 7:47–50, July, **1959.** 13 refs. **DLC**—The always growing pollution of water reservoirs in the USSR by chemically impure sewage, mainly from industrial plants, is greatly favored by the high permissible amounts of harmful matter concentration established by the State Sanitation Inspection of the Ministry of Health Services USSR for 33 chemical agents in 1956. The author shows the fallacy of these high permissible norms which not only permit pollution of the water reservoirs, but also legalize the enormous waste of valuable products by industrial enterprises. Numerous examples of such waste in many fields of the nonferrous metallurgical, oil and other industries are cited. *Subject Headings:* **1. Water pollution 2. U.S.S.R.**—*A.M.P.*

11.8–132 551.501:551.579.5

Weise, Rudolf (*Würzburg*), **Volumentrockengewichtsbestimmungen bei Bodenfeuchtemessungen und ihre Weiterverarbeitung zu Schlussfolgerungen über die Struktur des Messfeldes.** [Volume dry weight determinations in soil moisture measurement and their further analysis for conclusions on the structure of the measuring field.] *Meteorologische Rundschau*, Berlin, 12(2):52–53, March/April **1959.** 5 refs. **DWB, DLC**—The advantages of volume dry weight determinations in soil moisture measurements as compared with soil moisture in percent of dry weight are discussed. Volume dry weight determinations not only yield conclusions regarding the inner structure of an unknown measuring field but also information on the differences in water balance if the soil is characterized by differential stratification. The author describes the application of the method of volume dry weight determination of soil moistures to a Wurzburg measuring field. The 60 samples taken at 10 cm levels from 0–100 cm are presented. They are analyzed successively by the Peirce criterion and the Moldenhauer reliability coefficient. The agreement of the numerical results with visual observations is demonstrated for the various layers. *Subject Heading:* **1. Soil moisture measurement techniques.**—*I.L.D.*

11.8–133 551.501:551.579.5:546.17

Burke, H. D. and Krumbach, A. W., Jr. (*both, Vicksburg Res. Center, Vicksburg, Miss.*), **Nitrogen probe for soil-moisture sampling.** *Journal of Geophysical Research*, Wash., D. C., 64(8):1039–1042, Aug. **1959.** 3 figs., 2 tables, 3 refs. **DLC**—Moisture determinations were made on soil cores frozen in hollow probes into which liquid nitrogen had been poured. Values compared closely with those from samples extracted by more conventional methods. *Subject Heading:* **1. Soil moisture measurement techniques.**—*Authors' abstract.*

11.8–134 551.579.5

Onchukov, D. N., **Dvizhenie paroobraznoĭ vlagi v verkhnikh sloiakh pochvy.** [Migration of water vapor in the upper soil layers.] *Pochvovedenie*, Moscow, No. 6:102–105, June **1959.** 2 figs., table, 6 refs., eq. **DWB, DLC.** Transl. into English in corresponding issue of *Soviet Soil Science*, Wash., D. C. **DWB** –The paper deals with the results of an investigation of vapor migration under field conditions by means of thermocouples which measure the psychrometric temperature difference of the soil pore air. A regularity was found in the diurnal changes of vapor pressure and of relative humidity in the soil pore air in various soil layers and a scheme of diurnal vapor migration in the upper soil layers is derived. *Subject Headings:* **1. Moisture transport 2. Soil moisture movement.** —*Author's abstract.*

4. GLACIOLOGY

See: **Annual report** (Sonnblick-Verein, Vienna), 11.8–2; **Internat. Glac. Exp. to Greenland, 1957–60** (Finsterwalder), 11.8–12.

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION

See also: **Manual for aurora observations** (U. S. Weather Bureau), 11.8–6; **Ballistic meteorology** (Belgium. Force Aérienne), 11.8–7; **Tables of cloud forms** (Netherlands Met. Inst.), 11.8–8; **Meteorological service of French West Africa** (Brouquet-Laglaire), 11.8–21; **Design for Aviation Weather System** (U. S. Weather Bureau), 11.8–28; **Weather observing and forecasting system 433L** (Austin Co.), 11.8–29; **Radio echoes from meteors** (Weiss), 11.8–68; **Soil moisture measurement** (Weise), 11.8–132; **Nitrogen probe for soil moisture sampling** (Burke, Krumbach), 11.8–133; **Cartographic representation on screen of cathode ray tube** (Wippermann), 11.8–167; **Method of computing temperature frequencies** (Rosenthal), 11.8–225; **Calculating the hydrograph of meltwater runoff** (Onufrienko), 11.8–287; **Microclimatological surveys** (Gol'tsberg), 11.8–306; **Lightning discharges and whistlers** (Norinder, Knudsen), 11.8–331.

11.8–135 551.501.45:551.553.8:551.515.2

Kimball, S. J., **Estimating the probability of hurricane-force winds affecting an air base.** *U. S. Air Weather Service, AWS Technical Report* 105–146, June **1958.** 15 p. 7 figs., 3 tables. **DWB** (055) U58a)—This report contains results of a study intended to aid forecasters at air bases subject to damaging winds from tropical cyclones. From this case study it has been concluded that the probability of storm centers passing over any circular area at any time during their career is equal to the probability of storm centers being within the parallel strip indicated in this report at a particular time. Methods of constructing probability tables and the procedures for estimating probabilities from the graphs are illustrated. *Subject Headings:* **1. Hurricane forecasting studies 2. Hurricane track forecasting 3. Computation tables.** —*N.N.*

11.8–136 551.501.45:519.2

Morgan, W. A. (*Met. Service, Dublin*), **Determination of the straight line of best fit to observational data of two related variates when both sets of values are subject to error.** *Royal Meteorological Society, Quarterly Journal*, 86(367):107–113, Jan. **1960.** 4 figs., table, 2 refs., 14 eqs. **DWB, DLC** –The general equation to a straight line of best fit to observational data of two related variates x and y is obtained by minimizing the general expression

$$\sum_{i=1}^{n} (y_i - ax_i - b)^2 \phi(a)$$

involving the departures of both variates from the line. It is shown that the only expression for $\phi(a)$ which produces consistent results with change of unit is $\phi(a) = \text{constant}.\ a^k$, where k depends on the relative errors (e_x, e_y) in measurements of the two variates. The line of best fit is shown to be $y - \bar{y}/Sy = c(x - \bar{x}/Sx)$ where c is obtained from the equation $(k+2)c^2$

$-2(k+1)rc+k=0$, in which r is the coefficient of correlation between x and y, and k is a given function of e_x and e_y. The usual regression lines and line with a slope equal to the geometric mean of the slopes of the two regression lines, arise as special cases of the general equation. Examples are given to show general application. *Subject Headings:* **1. Statistical analysis 2. Computation of correlation coefficients.**—*Author's abstract.*

11.8–137 551.501.45:519.2

Schumann, T. E. W., **The graduation or smoothing of data in one and two dimensions.** *South Africa. Weather Bureau, Notos*, 6(3/4):114–119, **1957.** 2 tables, 2 refs., 53 eqs. **DWB** —Analytical expressions are presented for the smoothing or "weight" function which is in effect operative when one wishes to smooth an evenly spaced time series and adopt WHITTAKER'S principle of minimizing the sum of the squared third differences of the graduated values plus a constant times the squared differences between crude and graduated values. The solution of the problem, given by WHITTAKER for the one-dimensional case, is extended to a grid of evenly spaced data and a complete solution of the two-dimensional case is presented here. *Subject Headings:* **1. Statistical analysis 2. Computation methods.**—*Author's abstract.*

11.8–138 551.501.6:551.515.4(45)

Ludlam, F. H. (*Dept. of Met., Imperial College, London*), **Thunderstorm studies, 1959: a call for voluntary observers.** *Weather*, London, 14(5):177–180, May **1959.** 2 figs. **DWB** — A study of the history of individual severe storms of northern Italy is presented. These storms are prevalent near the southeast shores of the large Lake Garda. From this observation it was possible to determine the sizes of the fallout manufactured in each thunder cloud, the sizes of the biggest stones and reasons why they are present only in young thunderheads. An illustrative example is quoted on the distribution of hailstones in the Horsham storm of Sept. 5, 1958. Details are discussed. *Subject Headings:* **1. Thunderstorms 2. Severe local storm analysis 3. Italy.**—*N.N.*

11.8–139 551.501.721:551.521.14

*Matuliavichene, V. I., **Opyt rascheta otrazhatel'noĭ sposobnosti nekotorykh podstilaiushchikh poverkhnosteĭ v vidimoĭ chasti spektra.** [Attempt at calculating the reflectivity of certain underlying surfaces in the visible portion of the spectrum.] *Lietuvos TSR Mokslų Akademija. Geologijos ir Geografijos Institutas, Moksliniai Pranešimai*, 10(1):81–87, **1959.** fig., table, refs. Lithuanian and English summaries p. 86–87.—The work gives the calculated values of 19 kinds of natural surfaces in the visible part of albedo spectrum. The data of the calculation are compared with the results of measurements made with the help of a selenium photoelement in the visible part of albedo spectrum on analogous surfaces. The calculated average values of albedo are lower than those obtained in experiments. A good agreement of the theoretical values with experimental ones is obtained for surfaces similar to orthotropical ones (snow, sand). *Subject Heading:* **1. Albedo measurements.**—*Author's abstract.*

11.8–140 551.501.776:551.507.352:778.53

Ronne, Claude, **On a method of cloud measurement from aircraft motion picture films.** Woods Hole Oceanographic Institution, Contract Cwb-9509; Grant NSF-G-7368, Technical Report No. 7, June **1959.** 13 p. 8 figs., 3 refs. **DWB** (M551.46 W894)—The report describes and illustrates two methods of quantitative time-lapse photography used in 1958 by the National Hurricane Research Project, in the study of heat and moisture budget of hurricanes. The cameras and their installation in reconnaissance aircraft, as well as their use in flight, are described. *Subject Headings:* **1. Cloud observation from airplanes 2. Cloud photography.**—*N.N.*

11.8–141 551.501.83:551.515.8:551.578.4

Norinder, Harald and Knudsen, Edgar, **Atmospheric electric discharges from distant snow squalls and occlusion fronts.** *Arkiv för Geofysik*, Stockholm, 2(26):533–550, **1958.** 17 figs., 2 tables, 7 refs. **DLC**—The execution of and results obtained from a series of investigations carried out in Sweden during 1955 -56 to determine the characteristics of sferics emanating from snow squalls and occlusion fronts are reported. The equiparant direction finders the of

cathode ray tube type and cathode ray oscillographs with accessory amplifier and sweep generator are described, and a detailed description with the aid of diagrams is given of the recording equipment. A series of individual synoptic situations characterized by occlusion fronts, cold fronts, snow squalls and squalls of rain and sleet are analyzed and it is shown that electrical discharges differing from those produced by lightning are associated with these meteorological phenomena. The new sferics display very regular variation forms even at short distances from the disturbance sources. The quasi periods for the new sferics are more regular than those for sferics produced by lightning. The duration of the semi-period for the new sferics is considerably longer than that for sferics from lightning discharges. The mechanism of origin of the new sferics is discussed. *Subject Headings:* **1. Sferics from occlusion fronts 2. Sferics from snow squalls 3. Sweden.**—*I.L.D.*

11.8–142 551.501.9:551.509.3(477)

Ponomarenko, I. N., **Opyt nauchno-metodicheskogo rukovodstva issledovaniiami po regional'noĭ sinoptike v operativnykh organakh UGMS USSR.** [Experiment in scientific-methodical direction of research on regional synoptics in the operational branches of the Hydrometeorological Service Administration of the Ukraine.] *Meteorologiia i Gidrologiia*, Leningrad, 9:42–43, Sept. **1958. DWB, DLC** –The author describes the results of investigations on regional synoptics carried out at various hydrometeorological stations under the scientific direction of the Directorate of Hydrometeorology of the Ukrainian SSR. The majority of the studies dealt with the synoptic conditions in the Ukraine attending the origin of atmospheric phenomena harmful to the national economy (fog, storm winds, low clouds, frosts, etc.). The climatic data obtained did not improve the quality of the forecasts since physical factors were not considered. The scientists of the Ukrainian Scientific Institute of Hydrometeorology worked out a program for investigating various atmospheric phenomena and useful results were obtained. The work of individuals (listed together with the subjects of investigation) were supervised by curators, who, in most cases, originated the program. They supervised and actively aided in the execution of the work by personal consultation or through writing. The existing deficiencies in this system of research and their elimination are discussed. *Subject Headings:* **1. Regional synoptics 2. Hydrologic forecasting 3. Ukraine.** —*I.L.D.*

OBSERVATIONAL DATA

See also: **Synoptic meteorology and the IGY** (Rubin), 11.8–10; **Plant phenology, Khibiny Mountains,** (Medvedev), 11.8–294; **Plant phenology, Subarctic** (Andreev, Vakhmina), 11.8–317.

11.8–143 551.506:551.509.21(47)

Pikersgil', G. P., **Neobyknovennye iavleniia pogody.** [Unusual weather phenomena.] *Meteorologiia i Gidrologiia*, Leningrad, No. 6:37–38, June **1958. DWB, DLC**—The summer of 1957 was unusually hot and dry in the Kuban; air temperatures reached 35–37°C in the middle of April and 40–41°C at the end of July. On July 25, 141 mm of rain fell in 50 minutes and hail stones of 200–260 grams, even as high as 1400 grams fell, at the Voznesensk station in the Krasnodar territory. The synoptic situation was characterized by the entrance of a cold front (associated with a deep cyclone over the Donbass) into the circulation system of a small partial cyclone formed over the central regions of the Northern Caucasus. The front which hitherto moved eastward began to move south to the foothills of the Caucasus. The factors involved in this heavy downpour may have been the unequal movement of different sections of the front during its reversal, influence of relief upon front movement and on the pressure variations and ascending motion in the frontal zone. On September 4, 1957, a strong squall occurred at the Krasnodar airport; within 15–30 min wind velocities of 30–40 m/sec were recorded. Its origin was associated with the evolution and displacement of a thunderstorm center and showers which appeared Sept. 4, 50–60 km south of Krasnodar in the vicinity of the crests of small waves in a dissipating meridionally oriented quasi-stationary front. The thunderstorm center moved initially southeast without change in intensity and then eastward. Before Krasnodar it moved southeast and intensified. *Subject Headings:* **1. Unusual weather phenomena 2. Excessive temperatures 3. Excessive rainfall 4. Krasnodar Territory, U.S.S.R.**—*I.L.D.*

11.8–144 551.506.1:551.582.2(452) 550.340.61

*Milan. Seminario Arcivescovile. Osservatorio di Fisica Terrestre, **Annuario.** [Yearbook.] Vols. 11, 12, 13 and 14, 1954-1957. Como, **1955–1958.** 22-29 p. each. figs., numerous tables. **DWB** (M551.M637an)—Tables and graphs give detailed (daily, monthly and annual) values of the usual meteorological elements, with two arrangements by day for each month and by element for the year. Graphs show the annual course of each element with respect to the mean, with textual summary accompanying each graph. Seismic data are also included. *Subject Headings:* **1. Annual meteorological data summaries 2. Observational data 3. Seismological data 4. Milan, Italy.**—*M.R.*

11.8–145 551.506.1(493)

Sneyers, R., **Le temps en janvier 1959.** [The weather during January 1959.] *Ciel et Terre*, Brussels, 75(3/4):159–161, March/April **1959.** 3 tables. **DLC**—Monthly account of the weather in Belgium. Data relating to temperature, precipitation, sunshine, etc. Prevailing disturbed regime. Much sunshine, but normal as concerns temperature, in spite of rather frequent frosts. Pluviometric excess localized to Low Belgium. Snowy, with persistent snow cover on the ground. *Subject Headings:* **1. Monthly climatic summaries 2. Belgium.** —*A.V.*

11.8–146 551.506.1(493)

Vandenplas, A., **Le temps en février 1959.** [The weather during February 1959.] *Ciel et Terre*, Brussels, 75(3/4):162-165, March/April **1959.** 2 figs., 3 tables. **DLC**—Monthly account of the weather in Belgium. Data relating to temperature, precipitation, sunshine, etc. Exceptional month. Permanent anticyclonic regime. Exceptionally dry. Very abnormal sunshine duration in Low and Middle Belgium and exceptional in High Belgium where sunshine duration recorded was equal to that normally observed in July. Absolute temperature exceptionally high and frequency of foggy days exceptionally high in Low and Middle Belgium. Two charts illustrate clearly the exceptional importance of these climatic anomalies (temperature and sunshine). *Subject Headings:* **1. Monthly climatic summaries 2. Belgium.** —*A.V.*

INSTRUMENT CARRIERS

See also: **Cloud measurement from aircraft motion pictures** (Ronne), 11.8–140; **ARDC Model Atmosphere** (Minzner), 11.8–178; **Instrumented aircraft** (Endlich, McLean), 11.8–250. For rockets and satellites *see:* **Sec. D5**, p. 1234.

11.8–147 551.507.7:551.508.29:551.508.54

†Rachele, Henry and McLardie, M. E., **The White Sands Missile Geophysics Research Tower.** *U. S. White Sands Signal Agency, Missile Geophysics Program Special Report*, No. 7, July **1957.** 50 p. 24 figs. (incl. photos), 3 tables, 22 refs., eqs. **DWB**—This report consists of a discussion of the most significant characteristics of each type of meteorological instrument which was selected for collecting wind velocity and temperature data from the Missile Geophysics Research Tower. A description of the tower structure, terrain, and climate of the area, including photographs, is incorporated to give an overall picture of the area in which the data are taken and the relative positions on the tower where each parameter is measured. *Subject Headings:* **1. Missile Geophysics Research Tower, White Sands, N. M. 2. Wind velocity measurement instruments 3. Temperature instruments 4. Tower observations.**—*Authors' abstract.*

INSTRUMENTS

See also: **White Sands research tower instrumentation** (Rachele, McLardie), 11.8–147; **Submicron particle measurement** (Rich), 11.8–173; **Calculator for temperature-humidity computation** (Killen, Evenson), 11.8–228; **Rawin evaluation of extreme winds** (Jordan), 11.8–248.

11.8–148 551.508:061.1(73)

Rockney, Vaughn D. (*U. S. W. B., Wash., D. C.*), **New developments in observations and instrumentation in the Weather Bureau.** *American Meteorological Society, Bulletin*, 40(11):

554–560, Nov. 1959. 7 photos, 4 refs. **DWB, DLC**—A review is made of programs for the development, procurement, and installation of new observing instruments by the Weather Bureau. Some new observational techniques which will be used with the new instruments are also described. The article deals with four main fields of observations—surface, upper-air, radar, and marine. *Subject Headings:* **1. Observation equipment 2. Observation techniques 3. U. S. Weather Bureau.**—*Author's abstract.*

11.8–149 551.508.26:546.49

Anishchenko, P. I., **Za ekonomiiu rtuti.** [Economizing on mercury.] *Meteorologiia i Gidrologiia*, Leningrad, No. 5:50, May 1959. **DWB, DLC**—The author suggests that all weather stations collect their broken thermometers once a year, put them into vessels and send the collected mercury to factories of hydrometeorological instruments and thereby conserve the valuable metal. *Subject Headings:* **1. Thermometers 2. Mercury.**—*I.L.D.*

11.8–150 551.508.29

†Fink, H. J. (*Clarendon Lab., Oxford, Eng.*), **A new absolute noise thermometer at low temperatures.** *Canadian Journal of Physics*, Ottawa, 37(12):1397–1406, Dec. 1959. 3 figs., table, 23 refs., 9 eqs. **DWB, DLC**—If three resistors, which are kept at different temperatures, are arranged in form of a π network and if two of the thermal noise voltages appearing across the π network are multiplied together and averaged with respect to time, then under certain conditions the correlation between those voltages can be made zero. This condition is used to calculate the temperature of one noise source provided all the resistance values and the other temperatures are known. A noise thermometer of this kind was constructed which is capable of measuring temperatures below approximately 140°K. The boiling points of liquid oxygen and liquid nitrogen were determined absolutely within 0.2%. Between 1.3°K and 4.2°K the thermometer had to be calibrated due to errors arising in the equipment and the measured temperatures were then accurate within $\pm 1\%$. *Subject Headings:* **1. Temperature instruments 2. "Noise" thermometers 3. Temperature measurement.**—*Author's abstract.*

11.8–151 551.508.45

Blackmore, W. R., **A thermistor hypsometer.** *Canadian Journal of Physics*, Ottawa, 37(12):1331–1338, Dec. 1959. 4 figs., 6 tables, 15 refs., 3 eqs. **DWB, DLC**—A thermistor hypsometer used as a sensitive, recording, gas-pressure measuring device is described. It is shown that the limitation on this device is the noise introduced by the pressure fluctuations over the surface of the boiling liquid. These fluctuations are about $\pm(5\text{–}10)\mu$ Hg peak- to peak. When a pressure measurement is averaged over a moderately short period of time it may be estimated to $\pm 1\mu$ Hg. *Subject Heading:* **1. Hypsometers.**—*Author's abstract.*

11.8–152 551.508.79:551.577:551.579

Zimont, I. L., **Dozhdeval'no-stokovaia ustanovka.** [A rainfall-runoff simulating apparatus.] *Meteorologiia i Gidrologiia*, Leningrad, No. 1:54–57, Jan. 1959. 4 figs., ref. **DWB, DLC**—With the aid of photographs and diagrams the author describes in detail the construction of an experimental rainfall runoff station by means of which it is possible to analyze runoff, filtration, soil erosion, etc., during rainfall and to simulate precipitation in different types of natural or regulated basins. The operation of this apparatus is outlined and some of the experimental studies on water balance made with it are mentioned. *Subject Headings:* **1. Hydrometeorological laboratories 2. Water balance experiments.**—*I.L.D.*

11.8–153 551.508.822:551.557

Miller, Paul H., **A proposed rabal system for the rapid acquisition of high-altitude wind data.** *U. S. Naval Ordnance Test Station, Inyokern, China Lake, California, NAVORD Report* 6593, NOTS TP 2325, Sept. 1959. 12 p. fig., 4 refs. **DWB**—A modified radiosonde has been assembled at the Naval Ordnance Test Station with which it is proposed to obtain high-altitude wind data more rapidly and economically than is possible with existing equipment. The unit consists of a battery and an AN/AMT-4 transmitter that emits an unmodulated carrier signal. The unit may be tracked with either one or two GMD-1 tracking antennas depending on whether the desired winds-aloft data is to be obtained by using an assumed

ascension rate or by triangulation. Advantages and disadvantages of both methods are outlined. The suggested configuration and methods eliminate many of the steps now involved in the determination of high-altitude winds. *Subject Headings:* **1. Radiosondes 2. Upper air wind measurement techniques.**—*Author's abstract.*

11.8–154 551.508.822

Todd, William, **RAWIN set AN/GMD-1A.** (In: American Meteorological Society. District of Columbia Branch, **Proceedings of the Workshop on Stratospheric Analysis and Forecasting, Feb. 1–3, 1956.** pub. **1956.** p. 3–19. 17 figs., eq.) **DWB**—In this comprehensive paper on the AN/GMD-1A radiosonde system the author discusses the principles underlying wind measurement with this device and the conditions which influence the ability of the rawin set to point correctly to the radiosonde. The latter include system errors involving errors in the horizontal distance of the radiosonde from the direction finder and the wind error contributed by an assumed angular error as a function of absolute elevation angle for various altitudes; limitations arising from the equipment threshold and the effect of the beam width of the antenna upon its ability to reduce the effect of reflection signals; dynamic errors resulting from (1) atmospheric turbulence causing a swinging of the radiosonde which in turn changes signal strength and polarization of the direction finder and from (2) the dynamic stability adjustment of the direction finder; errors due to polarization changes induced by the swinging of the radiosonde; and atmospheric refraction errors. The flight equipment (Radiosonde Set AN/AMQ-9) is described in detail. *Subject Headings:* **1. Radiosondes 2. Rawin computation errors.**—*I.L.D.*

11.8–155 551.508.824

Automatic weather station. *Science*, Wash., D. C., 130(3366):29, July 3, **1959. DWB, DLC**—A new automatic "weather bureau" has been built for the U. S. Army. It consists of a steel cubicle 7 by 7 by 8 ft and weighs less than a ton. This is a mechanical station that operates unattended and can be set up anywhere in the world as a complete meteorological station to take observations and report data over wire or radio facilities to any central station, either on demand or at prescribed intervals. The new equipment eliminates human supervision. *Subject Headings:* **1. Automatic weather stations 2. Meteorological stations.**—*N.N.*

SYNOPTIC ANALYSIS AND FORECASTING

See also: **Synoptic meteorology and IGY** (Rubin), 11.8–10; **Fisheries forecasting service, Sakhalin** (Shteĭnfel'd), 11.8–19; **Weather observing and forecasting system 433L** (Austin Co.), 11.8–29; **Runoff forecasting from snow surveys** (Wöhr), 11.8–129; **Synoptic meteorological research, Ukraine** (Ponomarenko), 11.8–142; **Air pollution and synoptic situation** (Péczely), 11.8–172; **Boundaries of large-scale synoptic processes** (Ped'), 11.8–196; **Variations of stratus cloud, Pembroke Dock** (Krill), 11.8–265.

11.8–156 551.509.1:621.396

U. S. Weather Bureau, **Weather radio broadcasts.** *Weatherwise*, Boston, 12(3):98–103, June **1959.** 3 figs., table, 5 refs. **DWB**—There are three types of weather broadcasts. First, those heard over the more popular AM and FM frequency channels of local commercial stations. Second, those heard over low or high radio frequencies and disseminated for the use of pilots and mariners. These broadcasts are made by the U. S. Weather Bureau over radio communication facilities of the Federal Aviation Agency and the U. S. Coast Guard. Though especially meant for airmen and mariners they are now being used by outdoor people also. Scheduled aviation weather broadcasts are made twice each hour over Federal Aviation Agency radio range stations having associated voice facilities. The radio facilities used for these broadcasts are low and medium frequency ranges and very high frequency omnidirectional ranges. The most useful are the continuous voice broadcasts for aviation. Third, District Forecast Centers of the Weather Bureau broadcast marine weather for the residents in the Great Lakes and Atlantic, Gulf and Pacific Coastal areas. Through these sources an amateur weatherman can get an extremely large volume and variety of weather data and can beneficially utilize them. *Subject Heading:* **1. Weather broadcasts.**—*I.S.*

11.8–157 551.509.2:551.579:639.2

Lebedev, A. A., **Morskoĭ gidrometeorologicheskiĭ i promyslovyĭ biulletin' (iz opyta Murmanskogo UGMS).** [Marine Hydrometeorological and Fishing Bulletin: experience of the Murmansk Branch of the Hydrometeorological Service.] *Meteorologiia i Gidrologiia*, Leningrad, No. 5:50, May **1959. DWB, DLC**—In order to provide the captains of fishing vessels with regular and timely information on weather and fishing conditions the Murmansk Hydrometeorological Service and the Polar Institute of the Marine Fishing Industry and Oceanography have combined to issue a **Marine Hydrometeorological and Fishing Bulletin.** It consists of two parts. The first part contains a review of meteorological and hydrological conditions, the second a review of the course and conditions of trawling and the expected fishing conditions. The weather data include the following, viz: data on atmospheric temperature anomalies, resultant winds according to periods with comparatively homogeneous atmospheric circulation, frequency of storms of more than 6–8 balls; frequency of fogs; and long range forecasts obtained from the Central Forecasting Institute. In the hydrological section special attention is given to the heat content of water masses so that data are given on distribution of temperature anomalies of water with depth at standard oceanographic sections, mean temperature by layers at hydrological stations and sections, also actual temperature distribution in fishing zones and in actual "squares," accurate data of air ice surveys, etc. In the second section are given data on the conditions of trawling by 5-day periods during the past month, movement of fishing vessels, mean catch per hr of trawling, fish assortments and feeding conditions and results of fish marking. The concluding section of the bulletin is a forecast of the expected fishing conditions in view of all hydrometeorological and ecological conditions. *Subject Headings:* **1. Fisheries weather forecasting 2. Marine hydrology 3. Marine meteorological data 4. Murmansk, U.S.S.R.**—*I.L.D.*

11.8–158 551.509.3:551.577.37:551.579.4(467.3)

§García Miralles, Victor (*Chief, Centro de Levante*) and Carrasco Andreu, Antonio (*Chief Sección de Climatologia*), **Lluvias de intensidad y extensión extraordinarias causantes de las inundaciones de los dias 13 y 14 de Octubre de 1957, en las provincias de Valencia, Castellón y Alicante.** [Heavy extensive rains as causes of the floods of Oct. 13–14, 1957 in the provinces of Valencia, Castellon and Alicante.] *Spain. Servicio Meteorológico Nacional, Publicaciones Serie A (Memorias)* No. 30, **1958.** 67 p. 11 figs., tables. **DWB, DLC**—A thorough and extensive economic, climatological, synoptic and aerological study of the flood situation of Oct. 13–14, 1957 in the Valencia region of Spain, which was accompanied by great destruction and loss of life. Data for a dense network of about 500 precipitation stations are tabulated by stations in each district for each day from Oct. 1–16. Heavy rains occurred on Oct. 2–4 and 12–16 in most places. Totals of >400 mm (16″) were recorded in some places during the 3 days, most of which fell on one day (13th). Synoptic charts are given for Oct. 12–13 and 14 and isohyetal charts for 24 hrs ending Oct. 13, 14 and 15, and for 3 days, isochronal charts of beginning of heavy rain, etc. *Subject Headings:* **1. Floods Oct. 14–16, 1957, Valencia, Spain 2. Synoptic flood studies 3. Valencia, Spain.**—*M.R.*

11.8–159 551.509.3:551.513.1

Kats, A. L., **Obshchiĭ indeks tsirkuliatsii kak pokazatel' zonal'nykh i meridional'nykh sinopticheskikh protsessov.** [General circulation index as an indicator of zonal and meridional synoptic processes.] *Meteorologiia i Gidrologiia*, Leningrad, No. 5:3–8, May **1959.** 1 fig., 2 tables, 4 refs. **DWB, DLC**—The author points out with the aid of specific examples the ineffectiveness of using only a single index of zonality for objective macrosynoptic analysis. This explains the absence of any perceptible relationship between the magnitude of the index of zonality and the properties of large scale weather, especially the distribution of temperature fields or their anomalies over Eurasia. A single index of meridionality, however, just as a single index of zonality, cannot permit us to judge in what relationship it stands to the other component of the circulation which is important in evaluating the entire macroprocess and its relationship to the meridional or zonal process. More satisfactory is the general circulation index computed as the ratio of intensity of meridional air exchange to zonal air exchange $\left(I' = \frac{I_n}{I_z}\right)$. The more intense and more marked is the meridional process the greater is the

value of the general index and vice versa. Much more important is the fact that the value of the general circulation index in meridional synoptic processes is considerably greater than in zonal processes. If the scales of planetary zonal and meridional atmospheric exchange in the troposphere are uniform then ($I' \geq 1$) would be a sharp boundary for attributing a macroprocess to the zonal ($I' < 1$) or meridional ($I' \geq 1$) type. Actually the scales of planetary zonal atmospheric exchange in the troposphere exceed the scale of meridional atmospheric exchange. The effectiveness of this criterion is tested for the period 1953–1957 and is found to be valid. *Subject Headings:* **1. General circulation theories 2. Synoptic analysis 3. Circulation indexes.**—*I.L.D.*

11.8–160 551.509.312:551.511.6:681.14

Dobryshman, E. M., **Ob odnom novom metode integrirovaniia nelineĭnogo uravneniia dlia vertikal'noĭ sostavliaiushcheĭ vikhria skorosti.** [New method of integrating the nonlinear equations for the vertical component of vorticity.] *Acta Meteorologica Sinica*, Peking, 30(2):121–136, **1959.** fig., 2 tables, 9 refs., 56 eqs. In Chinese: Russian summary p. 136. **DWB**—Current numerical methods of short-range forecasting of the pressure field are based on the solution of elliptical equations relating to the local derivative of geopotential ($\delta z/\delta t$) or of the function of flow ($\delta \psi/\delta t$). The general form of such equations is $L(\delta z/\delta t) = F(x,y,\xi,z(x,y,\xi,t))$ where L is a linear differential operator acting only upon the coordinates. Operator L^{-1} also acts only upon the coordinates. In this paper a different way of solving the above equation is proposed. On the left side of the equation the largest operator is found for which a reciprocal can be obviously obtained, and the problem is solved for this operator with the initial data. The regular operator can also be extended by adding a term accounting for the Coriolis effect, which is important in large-scale atmospheric processes. First, the case of a barotropic model in Descartes coordinates is analyzed, then that of a general baroclinic model in spherical coordinates. Finally, an example is given for the detailed solution of a nonlinear vorticity equation. *Subject Heading:* **1. Vorticity calculations.**—*Transl. of author's abstract.*

11.8–161 551.509.312:551.511.6

Holl, Manfred M., **A numerical investigation of the barotropic development of eddies.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 61, Dec. **1958.** 98 p. 15 figs., 10 refs., 161 eqs. **DWB, DLC**—This paper deals with the formation of eddies in a straight parallel or zonal flow and with the subsequent modification of the flow profile. The fluid is taken to be homogeneous and inviscid. Numerical analogs for the physical equations are developed in detail and are analyzed. The work begins with the linear theory of dynamic stability. Numerical analogs are developed to determine the evolution of perturbations, sinusoidal along the flow, which are initially prescribed with arbitrary wave number, amplitude, and tilt variations, and which are superimposed on arbitrary flows. These flows are straight-parallel and are unbounded, or are half-bounded or bounded by plane surfaces. Integrations are carried out for an unbounded flow profile with an inflection point. Unstable perturbations are isolated and the unstable spectrum is determined. A numerical analog for the finite-amplitude problem, by which one can study the transfer of energy from the mean flow to the eddy is then developed. The most unstable perturbation, linearly determined, is taken as a small but finite disturbance. The integration is carried out and reveals the continued growth of the eddy and the modification of the mean flow. This method of investigation with added lapse rate and compressibility is discussed as an approach to turbulence, and to the modification of wind shear and lapse rate by the developed eddies. The general problem of numerical analogs for integrations requiring finite time-steps is also briefly discussed. *Subject Headings:* **1. Numerical forecasting 2. Barotropic vorticity equations.**—*Author's abstract.*

11.8–162 551.509.312:551.547

Obukhov, A. M. and Chaplygina, A. S., **Izmenenie baricheskogo polia v sredneĭ troposfere.** [Changes in the pressure field of the middle troposphere.] *Akademiia Nauk SSSR. Institut Fiziki Atmosfery, Trudy*, No. 2:23–49, **1958.** 13 figs., 6 tables, 4 refs., 36 eqs. **DLC**—The contents of this study include the following, viz.: the application of the quasigeostrophic

approximation to investigation of variations of the thermobaric field and of vertical velocities by A. M. Obukhov; statistical evaluation of the scale of disturbances in an isallobaric field; empirical investigation of variations of the thermobaric field; and the development of a reliable method for forecasting the pressure field at the 700 mb level, including selection of the optimum averaging radius; forecasting of the fundamental pressure field and the method of constructing the daily variations of H_{700}. It is shown that vortex transport to H_{700} level is one of the fundamental factors of pressure change. *Subject Headings:* **1. Isallobaric analysis 2. Pressure change calculations.**—*I.L.D.*

11.8–163 551.509.313:551.543.1:551.547:519.241.1

Belov, P. N., **Prognosticheskie vozmozhnosti empiricheskikh funktsii vliianiia i ikh svoĭstva.** [Prognostic applications of the empirical influence functions and their properties.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 5:778–782, 1959. 3 figs., 2 tables, 12 refs., 1 eq. **DWB, DLC**—The author presents the results of empirical work on forecasting pressure fields of different levels 24 and 36 hours in advance. This study is based upon the results of hydrodynamic forecasting theory and on high speed computation technique. The variation of pressure at sea level at any point 24 or 36 hours in advance is represented by the equation

$$SP = A_{00} \sum_{j=0}^{m} \sum_{i=1}^{n} A_{ij} H_{ij} + \sum_{j=1}^{m} B_j (H_j, H_{j-1})$$

where H_i = value of the geopotential of isobaric surfaces j at the meteorological stations i at the initial moment; Jacobians (H_j, H_{j-1}) characterize the transport of temperature in the layer between the isobaric surfaces i and $j-1$ over the point of the forecast; coefficients A_{ij} and B_j are determined from past data by the method of least squares. An attempt was made to obtain empirical functions of influence for forecasting pressure change at sea level and at the 700 mb and 500 mb surfaces during winter at 20 points in the USSR. The initial data were reports of the isobaric surfaces of 1000 ($j=0$), 700 ($j=1$) and 300 ($j=2$) mb in the morning and evening for 175 days out of three winters at 44 stations over Europe and Western Siberia. It was necessary to set up and solve 120 systems of normal equations with 45 unknowns which represented the values A_{ij} and B_j. A table giving data on the estimate of the accuracy of the constructed regression equation for forecasting pressure variations at different levels 24 and 36 hours in advance for different points is presented. Coefficients of correlation between 0.65 and 0.80 correspond to the constructed empirical regression equations for forecasting pressure. The mean square error σ_0 was 5 mb for the 24 hour forecast and 6.7 mb for the 36 hour forecast. The constructed influence function takes partly into account the daily temperature variation, i.e. advection of heat as a result of non-adiabatic factors. The computed empirical function of influence A_{ij} is analyzed for a 24 hour forecast for Moscow. *Subject Headings:* **1. Pressure change forecasting 2. Numerical forecasting techniques.**—*I.L.D.*

11.8–164 551.509.313 551.511.32:551.513:517.564

†Bryan, Kirk (*Woods Hole Oceanog. Inst.*), **A numerical investigation of certain features of the general circulation.** *Tellus*, Stockholm, 11(2):163–174, May 1959. 2 figs., 2 tables, 19 refs., 33 eqs. **DWB, DLC**—The space variables of a two-layer, quasi-geostrophic model, which includes nonadiabatic terms and a variable static stability, are expanded in a few leading terms of a spherical harmonic series. The terms are chosen to specify a zonal current with a belt of easterlies and westerlies, and a single baroclinic wave. These expansions are used to transform the equations of the model into a set of thirteen ordinary differential equations. Numerical experiments have been carried out with this system for different wave lengths of disturbance and different levels of heating contrast. The solutions indicate that the system combines many effects noted in the "dishpan" experiments and theoretical stability studies of large-scale motions. *Subject Headings:* **1. General circulation studies 2. Numerical forecasting 3. Two-level forecasting model.**—*Author's abstract.*

11.8–165 551.509.313:551.547.3

Kogan, S. Ia., **O kratkosrochnom prognoze polia davleniia v sredneĭ troposfere pri pomoshchi linearizirovannogo uravneniia Fridmana.** [Short-range forecasting of the pressure field in the middle troposphere using Fridman's linear equation.] *Akademiia Nauk SSSR*

Institut Fiziki Atmosfery, Trudy, No. 2:167–176, 1958. 9 figs., 1 table, 2 refs., 8 eqs. **DLC**—The author examines the solution of the problem of short range forecasting of the field of pressure at the mean level of the atmosphere by linearizing the equation of Fridman for the vertical component of the absolute vortex. By utilizing this equation it is possible to reduce the problem approximately to the solution of the equation

$$\left(\frac{\partial}{\partial t}+U\frac{\partial}{\partial x}\right)\left(\frac{\partial^2 p'}{\partial x^2}+\frac{\partial^2 p'}{\partial y^2}\right)+\beta\frac{\partial p'}{\partial x}=0.$$

This formula is rewritten in the form

$$\frac{\partial \Delta p}{dt}+\frac{1}{2}\frac{\partial p}{\partial x}=0 \qquad \left(\Delta=\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right).$$

This problem of Cauchy is solved by Fourier's method, then

$$p(x,y,t)=\frac{1}{4\pi^2}\int\int_{-\infty}^{\infty}\int\int p(\xi,\eta,0)e^{i[k(x-\xi)+m(y-\eta)+(kt/2(k^2+m^2))]}d\xi d\eta dk dm.$$

Proceeding from real values of R (radius of region of influence) for forecasts of 24 hours of the order of 1500 km, Cx can be considered as 17 m/sec so that the above equation becomes

$$p(x,y,t)=\rho(x,y,0)+\int\int p(\xi,\eta,0)K(x-\xi,y-\eta,t)d\xi d\eta$$

where the nucleus $K(x-\xi,y-\eta,t)$ has the form

$$K(x-\xi,y-\eta,t)=\frac{1}{4\pi}\left\{\int_{\epsilon^2}^{\infty}\left[I_0\left(\sqrt{r^2z+tr\cos\delta+\frac{t^2}{4z}}\right)-I_0(r\sqrt{z})\right]dz-\frac{2\epsilon}{r}I_1(r\epsilon)\right\}$$

$$r=\sqrt{(x-\xi)^2+(y-\eta)^2}$$

$$\cos\delta=\frac{x-\xi}{r}.$$

The results of calculations of $K(r-\xi,y-\eta,1).10^4$ are presented in a table and forecast and actual AT_{500} maps for Dec. 29, 1949 are presented. *Subject Headings:* **1. Upper air pressure forecasting 2. Pressure change calculations.**—*I.L.D.*

11.8–166 551.509.317:551.547.5:551.511.6

Khazova, O. N., **K voprosu prognoza vysotnykh baricheskikh sistem v elementarnom sinopticheskom protsesse.** [Forecasting upper air pressure systems associated with basic synoptic processes.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 63:50–63, **1957.** 4 figs., 3 tables, 7 refs. **DLC**—The theorem of absolute vorticity conservation was used in this paper for obtaining prognostic indications for upper-air pressure systems of one or other sign in the following natural synoptic period. The Laplacian of geopotential H on the basis of the 500 mb level was used for computing the vorticity during 3 winter months (Dec. 1955, Jan. Feb. 1956). It was found that vorticity charts and differences of geopotentials make it possible to obtain definite prognostic indications in the sign of the upper-air pressure field in a geographical region for the following basic synoptic process. These indications prove to be accurate in 88% of cases, both in case of pressure formations with closed and open circulation. *Subject Headings:* **1. Upper air pressure forecasting 2. Vorticity conservation.**—*A.M.P.*

11.8–167 551.509.317:681.14:621.385.832

Wippermann, F. (*Tech. Hochschule, Darmstadt, Meteor, Inst.*), **Kartenmässige Darstellung atmosphärischer Felder auf dem Schirm einer Kathodenstrahlröhre.** [Cartographic representation of atmospheric fields on the screen of a cathode ray tube.] *Tellus*, Stockholm, 11(2):253–256, May **1959.** 2 figs., 3 refs. **DWB, DLC**—In this article, a method whereby reasonably continuous isobars or isohypses (on 500 mb chart) may be represented on a cathode

ray tube by projecting on a cathode ray screen film images of maps produced by an IBM 704 computer (for example) with only grid points represented. Variations of the programming can make it possible to have resulting isolines heavier or lighter where needed for reference purposes (every second or third line, for example, can be thicker or one heavy base line could be presented for calculation of actual values). Each image on the film takes about 45 sec to produce and thus for a 72 hr prognostic chart development it would take 13.9hrs to produce the 1152 images needed for production of smooth isohypse or isobaric patterns. *Subject Heading:* **1. Electronic computer application to upper air charts.**—*M.R.*

11.8–168 551.509.318:551.509.323.2(476)

*Peryshkin, I. P., **K prognozu zamorozkov po territorii Belorussii.** [Forecasting frosts in Byelorussia.] *Sbornik Rabot po Sinoptike*, Moscow, No. 3:3–24, 1959. 8 figs., 9 tables, 12 refs. **DWB**—The author investigated the meteorological and synoptic conditions of the formation of frosts in Byelorussia and indications for forecasting them 2–3 days in advance. Data covering the period 1946–1953 were used. The synoptic and meteorological conditions of frosts during the intervals from stability to the passage of the mean daily temperature through 5°C in spring and to the reverse passage in fall, and natural synoptic periods were studied. Maps showing the distribution of the period of duration from transition of mean daily air temperature through +10°C to late frost in spring in days and distribution of duration from first frost to transition of mean daily temperature through +10°C in fall in days in Byelorussia, paths of incursion of cold air in Byelorussia, and tables giving data on frequency of various natural synoptic periods and number of frosts, distribution of fronts as a function of weather during different degrees of soil moisture, distribution of probability and extent of frosts in Byelorussia during incursion of cold air, etc. are presented. The regions of Byelorussia most often threatened with frost in spring is the northeastern part of the republic and also the districts of the Gontsevicha and Krestunovo in the northwestern part of the Poless'e plain. The atmospheric processes favoring the incursion of cold air in the Byelorussia comprise four types depending upon whether the incursion is from the British Isles, from Jan Mayen Island, from Spitsbergen or from the northeastern territories of the U.S.S.R. The occurrence of frosts depends primarily upon the temperature of the incoming cold air. In the case of cold air from the north of the British Isles the spring and fall frosts occur only if the incoming cold air north of the British Isles is at 0300 o'clock Moscow time less than +8°C during the natural synoptic period preceding incursion; in the incursion of cold air from Spitsbergen, frosts occur when the air temperature at 0300 o'clock Moscow time in Spitsbergen is less than +4°C during the natural synoptic period preceding incursion; during incursion from northeast U.S.S.R. frosts occur in Byelorussia only if the air temperature at 0300 o'clock Moscow time is in northeastern U.S.S.R. less than +2°C and less then +4°C in the fall during the natural synoptic period preceding incursion. In the occurrence of frosts in Byelorussia a great role is also played by the heat regime of this region on the eve of incursion of warm air. In forecasting frosts in Byelorussia it is necessary to take into account simultaneously both the type of incursion and the heat conditions. *Subject Headings:* **1. Frost forecasting rules 2. Synoptic conditions for frost 3. Byelorussian S.S.R.**—*I.L.D.*

11.8–169 551.509.318:551.509.323.2(479.24)

*Strakhov, S. N. and Filippova, E. N., **Issledovanie estestvennykh sinopticheskikh periodov, kharakterizuiushchikhsia vozniknoveniem osennikh i vesennikh zamorozkov v Azerbaĭdzhane.** [Investigation of natural synoptic periods, characterized by spring and autumn frosts in Azerbaidzhan.] *Sbornik Rabot po Sinoptike*, Moscow, No. 3:51–76, 1959. 8 figs., 15 tables, 2 refs. **DWB**—In order to establish and facilitate frost forecasts 2–3 days in advance and in some cases 5–7 days, the authors investigated the natural synoptic periods characterized by spring and fall frosts in Azerbaidzhan to determine their typology and to establish forecast criteria. The physical geographic characteristics of Azerbaidzhan and the distribution of frosts are discussed. Three types of natural synoptic periods producing frosts were established depending upon the origin of cold air masses spreading across the Caucasus and the Azerbaidzhan SSR. The first type contains synoptic processes associated with northern and northwestern incursions of air masses. These incursions are the result of the displacement of a region of high pressure from regions north of Scandinavia and northwest of

European USSR southward and toward the Caucasus. The second type of natural synoptic period is associated with synoptic processes involving the spread of cold air from western Europe to western European USSR and Transcaucasus; here an anticyclonic nucleus of high pressure is displaced across the central regions of western Europe. The third type involves the spread of cold air masses from the northeast and east, i.e. Western Siberia; during particular processes high pressures are displaced from regions of Western Siberia to European USSR where they are often quasistationary and during the movement of the cyclone across the south of the Caspian a flow of cold air to the Caucasus occurs. The variations of minimum air and soil surface temperature, atmospheric and soil frosts, associated with various natural synoptic periods of specific dates, nocturnal air temperatures over southern European USSR during the various natural synoptic periods with frosts and during analogous periods without frosts are described with the aid of numerical data and forecasting criteria for the formation of frosts are established. The fundamental forecast criteria of the origin of frosts in Azerbaidzhan are the presence of nocturnal atmospheric temperature close to 0°C over the southern parts of European USSR during the synoptic processes of any of the three types. In addition the index of the meridional circulation can be used supplementarily in forecasting frosts 1–3 days in advance. *Subject Headings:* **1. Frost forecasting rules 2. Azerbaidzhan S.S.R.**—*I.L.D.*

ARTIFICIAL PRECIPITATION

See: **Silver iodide in rainwater** (Gübeli), 11.8–275.

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

ATMOSPHERIC COMPOSITION AND POLLUTION

See also: **Fog and smoke at Orly Airport** (Duvergé), 11.8–30; **Fall of small particles in upper atmosphere** (Banister), 11.8–176; **Ratio of sodium to potassium in upper atmosphere** (Lytle, Hunten), 11.8–177; **Natural aerosols and nuclear debris** (Drevinsky et al.), 11.8–180; **Radioactive particles in atmosphere** (von Kilinski), 11.8–182; **Smoke diffusion from stacks** (Gandin, Solovei'chik), 11.8–192; **Atmospheric diffusion** (Monin), 11.8–193; **Sublimation nuclei** (Day), 11.8–257; **Volcanoes as source of ice nuclei** (Isono et al.), 11.8–258; **Nitrogen in snow, New Zealand** (Wilson), 11.8–278; **Air chemistry, Linz region** (Weiss, Frenzel), 11.8–310; **Air pollution and atmospheric electricity** (Beckett), 11.8–311.

11.8–170 551.510.41:546.214(437)

†*Pícha, Jaroslav, **Některé výsledky z měření přízemního ozónu v Hradci Králové v roce 1957.** [Some results of the measurements of surface ozone at Hradec Králové in 1957.] *Meteorologické Zprávy*, Prague, 12(2/3):48–53, **1959.** 9 figs., 5 tables, 18 refs. **DWB, DLC**—Results of surface ozone measurements made at Hradec Králové during 1957 at 9, 12 and 15 h are presented. EHMERT's method was used. Data on daily and annual ozone variations are presented and compared with variations of a number of meteorological parameters. The surface ozone amount is found to depend on both horizontal and vertical exchange. The weather situation is a decisive factor. The highest daily values are obtained at 15 h; the annual maximum is in early summer; the minimum in December. High values of O_3 are obtained during good visibility and sunshine in cyclonic situations involving cold air advection from the north. Small or no O_3 values are measured in stationary (winter anticyclones) air, in fog, or during warm front precipitation. *Subject Headings:* **1. Surface ozone measurements 2. Hradec Králové, Czechoslovakia.**—*G.T.*

11.8–171 551.510.42:551.521.16:551.588.7

†Fedorov, M. M., **Vliianie zadymlennosti na svetovoĭ rezhim goroda.** [The effect of smoke on the illumination conditions of a city.] *Gigiena i Sanitariia*, Moscow, 23(8):14–18, Aug. **1958.** 2 figs., 2 tables, 10 refs. **DLC**—The effect of smoke on illumination conditions in Zaporozh'e was investigated during 1950–1953 by measuring total and diffuse illumination in various parts of the city. In the factory district the illumination by diffuse light from the sky was considerably reduced as compared with the values obtained at the Pedagogical In-

stitute. The difference in values of the midday diffuse illumination ranged from 4–6% (May–June) to 21.2% (Dec.) with an average value of 13%. The results of a more detailed study of the loss of light as a result of smoke, carried out in an industrial and rural district during an automobile trip on sunny cloudless days, showed that the total illumination in villages in the vicinity of a factory district was reduced by 5–18% as compared with the central part of the old city. In the latter, illumination is reduced by 5% in comparison with the rural district. Tables giving the results of the measurements on illumination and zones of loss of illumination in the Zaporozhstali district are presented. *Subject Headings:* **1. Smoke effects on illumination 2. Zaporozh'e, U.S.S.R.**—*I.L.D.*

11.8–172 551.510.42:551.509.318(439.1)

Péczely, György, **Budapest légszennyeződése különböző makroszinoptikus helyzetekben.** [Air pollution in Budapest in various large-scale synoptic situations.] *Időjárás*, Budapest, 63(1):19–27, Jan./Feb. **1959.** fig., 5 tables, 6 refs., eqs. Russian summary p. 19. **DLC**—Atmospheric pollution measurements are now being made on a routine basis at several points in Budapest, but records have not been kept long enough for a statistical evaluation. Sunshine duration (1930–1956) and global radiation (1954–1956) in and outside the city are therefore analyzed as criteria of air pollution and the indirect air pollution indices thus obtained are compared with synoptic types. It is found that air pollution is most likely to occur during anticyclonic situations associated with weak easterly wind, while pollution is weak during cyclonic situations with strong turbulent currents. *Subject Headings:* **1. Atmospheric pollution measurements 2. Atmospheric pollution variations 3. Budapest, Hungary.**—*G.T.*

11.8–173 551.510.42 551.508.91

Rich, T. A. (*G. E. Co., N. Y.*), **The average size of submicron particles.** *International Journal of Air Pollution*, N. Y., 1(4):288–292, April **1959.** 2 figs., ref., 3 eqs. **DWB, DLC**—The best criterion of the efficiency of air cleaning is the number of submicron particles remaining in the cleaned air. When a volume is to be maintained at a high level of cleanliness, it is not enough to filter particulates from the incoming air. The air may contain gases which can react later to produce particles within the volume or particles may be created by some activity within the volume. The number of particles in the air may be measured at any time with a photoelectric nucleus counter. The mass per particle counted may vary by a factor of 10^6 or more and therefore a size spectrum is most desirable in evaluating the amount of contamination or in tracing the source of contamination. Particles resulting from gas reactions are usually in the 10 to 50 Å range of radii whereas leakage of unfiltered air produces particles in the neighborhood of 300 Å. A size spectrum is somewhat of a chore to obtain, but an average size can be obtained easily. The charge distribution of a population of particles follows BOLTZMANN'S law and it is shown that an average size may be obtained by measuring the total number of particles and the number of uncharged particles. The uncharged particles are obtained by passing the aerosol through an electric field which is intense enough to pull all the charged particles out of the air stream. The relations between size of particles and the charge distribution are given in graphical form. The auxiliary apparatus needed for the determination of average size is shown. *Subject Headings:* **1. Particle size determination techniques 2. Photoelectric nuclei counters 3. Atmospheric pollution.**—*Author's abstract.*

STRUCTURE OF THE ATMOSPHERE

See also: **ARDC Model Atmosphere, 1959** (Minzner et al.), 11.8–178; **Heat balance of troposphere** (Kasten et al.), 11.8–188.

11.8–174 551.510.52:551.510.522

*†Ramdas, L. A. (*Pres. of Section of Physics, Indian Science Congress, 1948*), **Physics of the bottom layers of the atmosphere.** *Indian Science Congress, 35th, 1958, Proceedings [of Section of Physics]*, p. 113–151. 16 figs., tables, 78 refs. Photostat available. **DWB** (M10 R169ph)—The troposphere, seat of most of the major weather phenomena like the production of clouds and rain, storms and depressions, etc., may be treated as a vast thermodynamic heat engine with water vapor as the working substance. Against a background of the work done in India,

the problems concerning the troposphere, problems related to the bottom layers of the atmosphere and the soil layers immediately in contact with them, are discussed, mathematically explained and profusely illustrated by graphs. First, solar radiation is explained and the amount of absorption is calculated. Black-body radiation from the earth is presented to compare and contrast with solar radiation. Problems of radiative equilibrium in different parts of the atmosphere are reviewed and in considerable detail the phenomena occurring at the base of the atmosphere are discussed. The last three sections of the article deal with the factors which control the thermal balance at the ground surface, the microclimates of plant communities and the problems of hydrology, rainfall, evaporation, soil moisture, etc. *Subject Headings:* **1. Troposphere 2. Lower troposphere 3. Soil atmosphere interaction.**—*I.S.*

UPPER ATMOSPHERE

See also: **Dynamics of exospheric matter** (Lucke), 11.8–17; **Generation of π mesons in stratosphere** (Alekseeva et al.), 11.8–93; **Wind field near the tropopause** (Saucier et al.), 11.8–251; **Cloud structure over tropical Pacific** (Riehl et al.), 11.8–263; **Electricity in upper atmosphere, Payerne** (Lugeon), 11.8–328; **Electric conductivity in ozone layer** (Lugeon), 11.8–330. For ionosphere *see:* **Sec. D4,** p. 1233.

11.8–175 551.510.53

Antanaitis, Peter; Borden, Thomas R., Jr. and Craig, Richard A. et al., **Contributions to stratospheric meteorology.** *U. S. Air Force. Cambridge Research Center, GRD Research Notes,* No. 1, Aug. **1958.** 134 p. figs., tables, refs., eqs. **DWB, DLC**—Contains discussions of the following eight interrelated studies of stratospheric meteorology: the analysis of synoptic charts in the stratosphere; the specification of the 50-mb wind field by vertical extrapolation; a climatological study of wind and temperature at 100, 50, and 25 mb over North America during the 1956–57 winter season; the wind field at 100,000 ft during the first six months of the IGY (July 1957–Dec. 1957); a preliminary study of the annual variation of the height and temperature at 100 and 50 mb along a north-south cross section from Alert to Guantanamo; an "explosive warming" at 25 mb in Jan. 1957; the temporal variability of stratosphere winds in middle latitudes; and finally, a discussion of the errors in forecasting winds in the stratosphere by persistence and climatology. *Subject Headings:* **1. Stratosphere. I. Hering, Wayne S. II. Muench, H. Stuart III. Salmela, Henry A. IV. Ohring, George** (*ed.*).—*N.N.*

11.8–176 551.510.53:551.510.42

Banister, John R., **Fall of small particles in the upper atmosphere.** *Sandia Corporation, Albuquerque, N. Mexico, Technical Memorandum* 18-59(51), Jan. 22, **1959.** 9 p. fig., table, ref. "Work performed under Contract At-(29-1)-789." **DWB** (M(055) S217t)—The altitude history of labeled debris of Hardtack Orange shot is calculated. This calculation, which ignores vertical atmospheric transport, indicates that particulate debris should soon fall to an altitude which can be reached by existing rocket sampler systems. After this initial rapid descent the fall rate decreases so the material remains at an intermediate altitude (100 to 250 kft) for a protracted period. *Subject Headings:* **1. Upper atmosphere 2. Small particles 3. Hardtack Orange shot.**—*Author's abstract.*

11.8–177 551.510.53:546.32:546.33:535.33

Lytle, E. A. and Hunten, D. M. (*both, Univ. Saskatchewan, Canada*), **The ratio of sodium to potassium in the upper atmosphere.** *Journal of Atmospheric and Terrestrial Physics,* N. Y., 16(3/4):236–245, Nov. **1959.** 3 figs., 2 tables, 25 refs. **DWB, DLC**—Since sodium in the upper atmosphere is observable by the resonance scattering of the *D*-lines, it is natural to inquire whether potassium might also be found. Of the likely sources for these substances, sea-water has an atomic abundance ratio Na:K of 47:1, while the rest are in the range between 5:1 and 10:1. Consideration of the chemical and ionic equilibria suggests that the ratio of free, neutral atoms in the upper atmosphere should be about the same as in the source. The potassium resonance lines are at 7665 and 7699 Å; the former is the stronger but is obliterated by a strong line of the atmospheric *A*-band. An infrared sensitive photomultiplier was used in a grating spectrometer along with a "condenser memory" permitting exposures to the twilight of 15 min or more. No potassium line has been detected; maximum possible intensities

have been estimated from the tracings and for some occasions an upper limit of 30:1 has been achieved for the Na:K ratio. This suggests that the source is sea water. Some measurements of the intensity ratio of the two *D*-lines are also reported. *Subject Headings:* **1. Upper atmosphere 2. Sodium in upper atmosphere 3. Potassium in upper atmosphere.**—*Authors' abstract.* Ⓢ

11.8–178 551.510.536:551.510.3:551.507.362.2

†Minzner, R. A.; Champion, K. S. W. and Pond, H. L., **The ARDC Model Atmosphere, 1959.** *U. S. Air Force. Cambridge Research Center, Air Force Surveys in Geophysics*, No. 115, Aug. **1959.** 137 p. 11 figs., numerous tables, 46 refs., 36 eqs. **DWB, DLC**—A model of the earth's atmosphere to 700 km is given. Below 53 km the present model is the same as **The ARDC Model Atmosphere 1956.** Above this height, changes have been made based on data deduced from rocket flights and from the rate of change of the orbital period of satellites. At approximately 600 km the new model gives densities that are 20 times higher than the 1956 model. Below 600 km the two models gradually come closer together and finally cross at about 150 km. Between 60 and 150 km the density for the 1959 model is lower, being about one half that of the 1956 model at 120 km. At the present time, the maximum altitude at which density data from satellites has been obtained is just below 700 km. For this reason, the tables end at 700 km. Dashed lines in the plots present a tentative extrapolation of the data to 1000 km. The value of the molecular weight, like other atmospheric properties, probably depends on both location and time. The 1959 model curve probably represents the molecular weight at high latitudes, such as Fort Churchill, where the experimental data were obtained. At lower latitudes the molecular weight may be nearer the curve given in the 1956 model. *Subject Headings:* **1. Exosphere 2. ARDC model atmosphere.**—*Author's abstract.* Ⓢ

11.8–179 551.510.536

†Paetzold, H. K., **Erforschung und Zustand der höchsten Atmosphäre oberhalb der Ionosphäre.** [Exploration and state of the highest atmosphere above the ionosphere.] Reprint from *Physikertagung München*, p. 63–82. Date not given. 13 figs., 5 tables, 24 refs.—The earth's atmosphere is bounded by the earth's surface and by the interplanetary space with its very slight mass density. The atmosphere is classified according to its thermal state above the tropopause. A maximum is reached in the mesosphere (280°K) at 45 to 50 km, but the expected second maximum at 300–400 km is very probably not reached because in this height the free path lengths of the molecules and atoms are no longer small in comparison to the extension of the atmosphere. The altitude at which this occurs is termed the critical height, which delimits the exosphere from the thermosphere. The author summarizes present knowledge on the electron density and temperature in interplanetary space, the composition of the atmosphere and temperature distribution at the critical height, temperature, density, energy balance, disappearance of gases in the inner exosphere, and H-atoms in the outer exosphere and the use of whistlers as a probe of the exosphere. *Subject Heading:* **1. Exosphere.**—*I.L.D.* Ⓢ

RADIO METEOROLOGY

See: **Scintillation in centimeter waves** (Arsac), 11.8–56; **Radionavigation and remote control** (Vassy), 11.8–107; **Meteor burst communication** (Montgomery), 11.8–320.

RADIOACTIVITY

See also: **Sec. B5,** p. 1217

11.8–180 551.510.7:551.510.42 551.577.7

Drevinsky, P. J.; Junge, C. E.; Blifford, I. H., Jr. et al., **Natural aerosols and nuclear debris studies: Progress Report No. 1.** *U. S. Air Force. Cambridge Research Center, G.R.D. Research Notes No. 8*, Sept. **1958.** 43 p. 9 figs., 8 tables, 16 refs.—A program of research on radioactive and inactive aerosols in the atmosphere is described. Preliminary results on the size distribution of particulate aerosols of the troposphere and stratosphere are presented. Results of measurements of Sr^{90} in polar snow cores and Sr^{90}, Ba^{140} and other fission products in precipitation and in stratospheric air are presented. These and related topics will be

discussed more comprehensively in subsequent reports, semiannually. *Subject Headings:* **1. Radioactivity in the atmosphere 2. Particle size distribution 3. Radioactivity in precipitation. I. Kalkstein, M. I. II. Martell, E. A.**—*Authors' abstract.*

11.8–181 551.510.7

Styra, B. I., **O teoreticheskikh skhemakh raspredeleniia radioaktivnykh veshchestv v svobodnoĭ atmosfere.** [Theoretical patterns of the distribution of radioactive matter in the free atmosphere.] *Lietuvos TSR Mokslų Akademija. Geologijos ir Geografijos Institutas, Moksliniai Pranešimai*, 10(1):39–55, **1959.** 4 figs., 2 tables, 16 refs., 25 eqs. Lithuanian and English summaries p. 51–52.—The first part of the article gives a short review of the results of the measurements of the distribution of radioactive materials in troposphere. It is shown, that, with general decrease of radioactivity with height, inversions of the concentration of radioactive materials take place. Theoretical schemes given by V. HESS, V. SCHMIDT and J. PRIEBSCH do not coincide with the results of the experiments. In connection with it, the HESS-SCHMIDT scheme is subject to some changes in practice. For this purpose the M. BUDYKO scheme of the variation of exchange coefficient in lower layers of atmosphere is applied, and the hypothesis of layer-convection structure of the atmosphere is used. The HESS-SCHMIDT equation is practically solved not proceeding from these assumptions but correspondingly changing the boundary conditions. Thus, there are two equation systems: the first refers to conditions above continents and the second refers to conditions above the sea surface. The calculation examples of the distribution of Rn in the atmosphere, obtained in this article, assume an uneven variation of turbulent exchange coefficient in different layers of convection. The results of the calculations are in agreement with the data, which the authors obtained from their experiments. *Subject Heading:* **1. Radioactivity in the atmosphere.**—*Author's abstract.*

11.8–182 551.510.7:551.510.42

von Kilinski, Erich, **Über die Existenz einzelner stark radioaktiver Partikel in der Atmosphäre.** [Existence of individual strongly radioactive particles in the atmosphere.] *Zeitschrift für Meteorologie*, Berlin, 12(7):202–204, **1958.** 2 figs., 1 ref. **DWB, DLC**—In the course of the measurement of atmospheric radioactivity at Potsdam by the suspension method on March 11 and 12, 1958, the filters showed an unusually high value of atmospheric radioactivity: namely, an impulse frequency of $64.65.10^{-12}$ microcurie/cm² was obtained. Data at the stations on the same day and at Potsdam before and after are presented and show considerably lower values. Investigation showed that this increased radioactivity originated in a single part of the filter. It is concluded that the atmosphere contains individual particles of high radioactivity; that such particles can be accidentally captured when the suspension method is used and thereby produce very high radioactivity; that the measurement of such activities is inexact since the geometry factor is point-shaped and surface-shaped activities is different. The reporting of activity per unit volume loses its meaning in the case of point-shaped activities. The point-shaped activities can be recognized with the aid of the cutting up method; and during the incorporation of very active particles a very great danger arises to the biological activities of the organism. *Subject Headings:* **1. Radioactivity in the atmosphere 2. Radioactivity in the atmosphere measurement techniques.**—*I.L.D.*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

See also: **Integrating equations for vertical component of vorticity** (Dobryshman), 11.8–160; **Barotropic development of eddies** (Holl), 11.8–161; **Numerical investigation of general circulation** (Bryan), 11.8–164; **Upper air pressure systems associated with basic synoptic processes** (Khazova), 11.8–166; **Wind divergence, vorticity and pressure change** (Mertsalov), 11.8–206; **Large scale atmospheric diffusion** (Saïssac), 11.8–238; **Nonstationary aspects of convection** (Dobryshman), 11.8–252; **Climatology of Central Asiatic Highlands** (Flohn), 11.8–291.

11.8–183 551.511:551.576.1

Shishkin, N. S., **O roste i raspade konvektivnykh oblakov pri neustoĭchivoĭ stratifikatsii atmosfery.** [Growth and disintegration of convective clouds during conditions of unstable

stratification of the atmosphere.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 82:3–21, 1958. 3 figs., 3 tables, 10 refs., 48 eqs. **DLC**—The problems of the formation and growth of convective clouds are presented from the point of view of the method of layers, and the disintegration of clouds in an unstable stratified atmosphere, with the formation of squalls is examined. The cause of formation of squalls is regarded as the development of descending currents penetrating the entire cloud layer in thunder clouds and shower clouds. The model proposed by the author does not require the formation of a "cold body." The descending current originates in the thunderstorm or shower clouds without any significant horizontal temperature contrasts which arise only in the descending current itself. By means of relevant equations the author analyzes the conditions of the origin and initial growth of convective clouds, the laws of the development of ascending and descending currents within convective clouds and the formation of squalls. The results of computations on the development of convective clouds, velocities of ascending motions in clouds according to data of airplane soundings and computation of velocities of descending currents in descending clouds according to morning radiosonde data are presented. *Subject Headings:* **1. Convective cloud structure 2. Squall clouds.**—*I.L.D.*

11.8–184 551.511:551.558.1:536.25:519.24

Vul'fson, N. I., **Statisticheskie metody opredeleniia deĭstvitel'nykh parametrov konvektivnykh potokov po nabliudaemym.** [Statistical methods of determining effective parameters of convective currents according to observation.] *Akademiia Nauk SSSR. Izvestiia, Ser. Geofiz.*, No. 7:876–890, 1958. 2 tables, 9 refs., 79 eqs. **DLC**—On the assumption that the forms of convective currents can be approximated by rotating bodies about a vertical axis and that they are randomly distributed in space the author derives equations by means of which it is possible to determine from the distribution of random values of intersections of convective currents by an airplane and the values of several characteristics measured in these intersections, the distribution of the actual dimensions of the currents and also the concentration of currents in space, their relative volume or relative area of the intersection at the level of flight. The equations are derived for both possible cases of convective current initiated at the surface of the earth or of ascending individually isolated air masses ('bubbles'). Tables for finding from observations the distribution of actual dimensions of convective currents and some characteristics (temperature) in the center of the currents are presented. An example of calculations illustrating the nature of convective movement in the free atmosphere is provided. The theory proposed can be applied to the statistical analysis of other phenomena in geophysics and also in biology, geology and astronomy in the case of systems with inclusions having the shape of rotating bodies and heterogeneous characteristics. *Subject Headings:* **1. Convective currents 2. Convective motion.** *Transl. of author's summary and I.L.D.*

11.8–185 551.511:551.547.5:551.524.72

***Zubian, G. D., O mezhshirotnom obmene teplykh i kholodnykh mass vozdukha v stratosfere zimoĭ.** [The interlatitudinal exchange of warm and cold air masses in the stratosphere in winter.] *Meteorologiia i Gidrologiia*, Leningrad, No. 1:3–12, Jan. 1959. 5 figs., 10 refs. **DWB, DLC**—The results of synoptic investigations of the intense interlatitudinal exchange of warm and cold air masses and of the extensive redistribution of temperature field and air currents observed in mid-winter of 1958 in the stratosphere of moderate and high latitudes of the Northern Hemisphere are presented. Maps of pressure topography of 100, 50 and 30 mb and corresponding isotherm maps were used, also the aerological observations of the station "North Pole," which drifted near the pole during the second half of Jan. 1958. The results indicate that in the middle stratosphere there occur periods of intensified interlatitudinal exchanges with air masses from moderate latitudes in the Central Arctic up to the pole and from the pole deep into the middle latitudes. With the aid of maps of absolute pressure topography and graphs of temperature distribution with altitude the author discusses the temperature distribution in the stratosphere in the period investigated, the resulting temperature gradients and the stratospheric air movements. *Subject Headings:* **1. Stratospheric temperature distribution 2. Stratospheric circulation 3. Temperature gradient in stratosphere.** *-I.L.D.*

11.8–186 551.511.2:551.513.1

Monin, A. S., **O preobrazovaniiakh energii zonal'noĭ tsirkuliatsii atmosfery.** [Energy transformations in the atmospheric zonal circulation.] *Akademiia Nauk SSSR. Institut Fiziki Atmosfery, Trudy*, No. 2:50–53, **1958.** 1 ref., 9 eqs. **DLC**—In the study of the general problem of the transformation of energy into atmospheric circulation the author deals only with the transformation of the zonal circulation into nonzonal disturbances. With the aid of the equation of motion and the corresponding equation of energy (both in vector form) the author shows that variations of the index of circulation with latitude and with height can lead to the development of nonzonal disturbances. An illustration of the development of a specific zonal profile is presented. *Subject Headings:* **1. Atmospheric circulation disturbances 2. Zonal circulation.**—*I.L.D.*

11.8–187 551.511.32:551.515.71

Mesinger, F., **O kriterijumu za hidrodinamičku nestabilmost horizontalnog kretanja po izobarama.** [On the criterion for hydrodynamic instability of horizontal isobaric motion.] *Belgrade. Univerzitet. Prirodno-Matematički Fakultet. Meteorološki Zavod. Rasprave*, No. 2:18–25, **1958.** 5 refs., 17 eqs. English summary p. 25.—The criterion for hydrodynamic instability of permanent, horizontal, isobaric motion derived by VAN MIEGHEM, is given in a new form. There are two differences between these criteria: 1) The new criterion is somewhat more general, because it is also valid for the case of abnormal flow. This fact has no special importance, because abnormal flow seldom occurs in the atmosphere, and if we nevertheless are interested in its hydrodynamic stability we can easily write an instability criterion for such a flow also in the form according to VAN MIEGHEM, simply reversing the sign of the inequality in it. 2) In the new criterion, instead of the speed of the air stands the horizontal component of the pressure force. This enables the derivation of several conclusions, referring particularly to the possibilities for hydrodynamic instability in strong anticyclones. These conclusions are: a. The threshold value of the instability of isobaric motion can be lowered, due to the anticyclonic curvature of the isobar, in extreme cases to one fourth of its value for the geostrophic motion. b. The extreme anticyclone (which, according to B. MAKSIĆ, must be barotropic) is indifferent for transverse displacements in the isentropic surface. c. When the horizontal component of the pressure force is near its maximum value a comparatively small value of baroclinity can produce hydrodynamic instability for transverse displacements close to the isentropic surface. *Subject Headings:* **1. Hydrodynamic equations 2. Instability criteria 3. Anticyclone circulation.**—*Author's abstract.*

11.8–188 551.511.33:551.524:551.521:551.510.52

*Kasten, Fritz; Korb, Günther et al, **On the heat balance of the troposphere.** Mainz, Johannes Gutenberg-Universität, Meteorologisch-Geophysikalisches Institut, Contract AF 61(052)-18, Final Report, Jan. **1959.** 89 p. 3 figs., numerous charts, 4 tables, 10 refs. **DWB** (M10.52 M227t)—The present report summarizes a study on the radiation balance of the troposphere that was begun in 1955 and has led now to a provisional conclusion. The results of the months investigated are represented in maps. Charts of cloudiness and total water vapor content of the troposphere are included for direct comparison. The maps of absorption, emission and tropospheric radiation balance show regions of high and low values of the respective quantities. High values of the tropospheric radiation balance mean considerable energy loss of the troposphere caused by radiative processes, and vice versa. For all regions investigated, maximum values of the tropospheric radiation balance are found during Nov. and amount to 250–300 cal $cm^{-2}d^{-1}$. Minimum energy loss, expressed by small values of the radiation balance, results for the period from May until July with values of 140–190 cal $cm^{-2}d^{-1}$. It is concluded that to study the complete heat balance of the atmosphere it is necessary to take into account the radiation balance of the atmosphere as well as the heat transfer from the earth's surface and finally also the latent heat released in condensation processes. *Subject Headings:* **1. Radiation balance of troposphere 2. Heat balance of troposphere. I. Manier, Gerhard II. Möller, Fritz.**—*I.S.*

11.8–189 551.511.33

Philip, J. R. (*Calif. Inst. of Techn.*), **The theory of local advection, pt. 1.** *Journal of Meteorology*, Boston, 16(5):535–547, Oct. **1959.** 5 figs., table, 78 eqs. **DWB, DLC**—This

paper is the first of a series in which the theory of local advection (the exchange due to horizontal heterogeneity) of energy and moisture will be developed and applied to a number of problems of practical and theoretical interest. The paper provides an introduction to the practical implications and physical basis of local advection, but it is mainly devoted to developing methods of analysis to be applied to later papers. The treatment aims to provide simple and rapid numerical procedures for the solution of advection problems. Methods are given for solving the two-dimensional atmospheric-diffusion equation subject to "concentration," "flux," and "radiation" types of boundary conditions. Appendices give discussions of the properties of the functions entering the solutions and provide simple means for their computation. Extensive tables of the relevant functions are given for the case $m=1/7$, $n=6/7$ (m, n being the exponents in the power-law approximations to the vertical profiles of mean wind speed and eddy diffusivity, respectively). The rudiments of a quantitative theory of advective inversion are developed, expressions being obtained for the equation of the inversion surface, and for the maximum height and downwind extent of the inversion. *Subject Heading:* **1. Advection theories.**—*Author's abstract.*

11.8–190 551.511.33:551.578.11

Troeger, Heinz (*Bremen*), **Der Gesamt-Wärmeinhalt der Luft bei Schauerwetter.** [The total heat content of the air during shower weather.] *Annalen der Meteorologie*, Hamburg, 8(11/12):357–358, **1959.** fig. **DWB, DLC** —During shower weather the recording apparatus of the hygrograph can scarcely follow the rapid changes of the individual weather element. The possibility exists that there is an element scarcely influenced by the individual shower. This element is the total heat content of the air and it is completely irrelevant whether it is expressed by pseudo potential temperature, by the equivalent temperature or even by the wet bulb temperature. Observations contributing to this problem are presented in the form of the variation of the equivalent temperature and vapor pressure for July 28, 1952 in Bremen. *Subject Headings:* **1. Atmospheric heat content 2. Thermodynamics of the atmosphere.**—*I.L.D.*

11.8–191 551.511.6

Böhme, W., **Eine neue Ableitung des von Sakakibara eingeführten transversalen Reibungsgliedes.** [A new derivation of the transverse friction term introduced by Sakakibara.] *Zeitschrift für Meteorologie*, Berlin, 12(7):193–201, **1958.** 22 refs., 73 eqs. **DWB, DLC** The air quanta which attain the level z_0 by virtue of the irregular vertical motion produced by turbulence originate from different initial levels z_0-l' where they possessed for the last time the vertical supplementary velocity z_0—and hence can be grouped in classes with similar mode of descent. At first a relation is derived, namely:

$$\widetilde{v(z_0,l')}=e^{-ml'}(\epsilon+\overline{v(z_0-l')})+e^{-mz_0}\int_{z_0-l'}^{z_0}(m\vartheta+\eta\beta)e^{mz}dz$$

relating the horizontal impulse of the average of the particles of class l' to the average stream field or more generally to the averaged forces. An analogous relationship namely:

$$\widetilde{v'(z_0,l';\vartheta,\beta,\epsilon)}=e^{-ml'}(\epsilon+\overline{v(z_0-l')})-\overline{v(z_0)}+e^{-mz_0}\int_{z_0-l'}^{z_0}(m\vartheta+\eta\beta)e^{mz}dz$$

unites the fluctuations of the horizontal velocity produced by the average of the particles in the class l' at the level z_0 with the cited magnitudes. After neglecting the influence of the equalized Eulerian acceleration (and a back coupled influence of acceleration) the latter equation, which then describes solely the dependence of the fluctuations of the horizontal velocity upon the equalized distribution of stream flow, is developed into a series according to the powers of the path of origin l'. If, as is customary in austausch considerations, it is assumed that the Taylor series for the equalized horizontal acceleration can be broken off near the second term, when the break is made with the term containing l', the power development yields the classical result, namely: the horizontal impulse is exchanged, the horizontal shearing tension can be represented as the product of the austausch coefficient and of the vertical derivative of the

equalized horizontal velocity. If the term containing the second power of l' is considered then the horizontal shearing tension is represented by the relationship

$$\bar{\rho}\overline{v'_x v'_z} = \overset{*}{A}\frac{\partial \bar{v}_x}{\partial z} - \mathring{A}\frac{\partial \bar{v}_y}{\partial z}, \qquad \bar{\rho}\overline{v'_y v'_z} = -\overset{*}{A}\frac{\partial \bar{v}_y}{\partial z} + \mathring{A}\frac{\partial \bar{v}_x}{\partial z}$$

which is equivalent to a relationship determined empirically by SAKAKIBARA for horizontal frictional force. The transversal friction coefficient, $\overset{*}{A}$, appearing in these relationships is proportional to the atmospheric density, the Coriolis parameter as well as approximately also to the mean square of the path of origin. *Subject Headings:* **1. Turbulence theory 2. Sakakibara's transverse friction term.**—*Transl. of author's summary & I.L.D.*

11.8–192 551.511.6:551.551.8:551.510.42:628.53

Gandin, L. S. and Soloveĭchik, R. E., **O rasprostranenii dyma iz fabrichnykh trub.** [Propagation of smoke from industrial stacks.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, 77:84–94, **1958.** 14 refs., 42 eqs. **DWB, DLC**—The authors present a theoretical mathematical treatment of the behavior of smoke under atmospheric conditions taking into account the influence of velocity of fall of the smoke particles. The authors solve the equation of stationary turbulent diffusion of heavy particles

$$u\frac{\partial q}{\partial x} - w\frac{\partial q}{\partial z} = \frac{\partial}{\partial y}\left(k_y\frac{\partial q}{\partial y}\right) + \frac{\partial}{\partial z}\left(k_z\frac{\partial q}{\partial z}\right)$$

where x and y=horizontal coordinates directed along and across the wind respectively, z=height, k_y=coefficient of horizontal turbulent diffusion, k_z=coefficient of turbulent diffusion along the vertical and u=wind velocity. Derivations of expressions are presented for the distribution of the concentration of particles of some particular radius r at the altitudinal axis source ($y=0$, $z=h$) namely

$$q_h = \frac{\left(\frac{u_1}{x}\right)^{\frac{1}{1+m}} Q h^m}{2(1+m)\sqrt{\pi k_0 k_1}}\, e^{-\frac{2u_1 h^{1+m}}{(1+m)^2 k_1 x}}\, I_{\frac{w}{(1+m)k_1}}\left\{\frac{2u_1 h^{1+m}}{(1+m)^2 k_1 x}\right\}$$

and for distribution of q_0—for a ground axis ($y=z=0$)

$$q_0 = \frac{\left(\frac{u_1}{x}\right)^{\frac{1}{1+m}} Q h^{m+\frac{w}{k_1}}}{2(1+m)\Gamma\left\{1+\frac{w}{(1+m)k_1}\right\}\sqrt{\pi k_0 k_1}} - \left[\frac{u_1}{(1+m)^2 k_1 x}\right]^{\frac{w}{(1+m)k_1}} e^{\frac{u_1 h^{1+m}}{(1+m)^2 k_1 x}}.$$

Further analysis of the solutions as carried out by means of dimensionless variables. The dependence of particle concentration upon intensity of source, the emission of a polydisperse admixture etc. are analyzed. *Subject Headings:* **1. Atmospheric pollution 2. Turbulent dispersion of particles.**—*I.L.D.*

11.8–193 551.511.6:551.551.8:551.510.42

Monin, A. S., **Atmosfernaia diffuziia.** [Atmospheric diffusion.] *Uspekhi Fizicheskikh Nauk*, Moscow, 67(1):119–130, Jan. **1959.** 38 refs., 23 eqs. **DWB**—A thorough and intensive review of the recent developments in application of turbulence theory to the problem of diffusion (e.g. of dust in the atmosphere). The original text was presented in English at the Oxford Symposium. Atmospheric diffusion and air pollution applications of knowledge gained by study of diffusion (factory pollution, radioactive debris, crop dusting, frost protection, sea salt, volcanic dust, bacteria or virus, pollen and seeds, humidity from ocean and dust from desert); factors affecting atmospheric diffusion of pollution (source, meteorological factors such as turbulence, character of particles, interaction of pollution with the ocean or land surface, distribution of pollution); characteristics of turbulent diffusion, analogy between small scale turbulent diffusion and molecular diffusion; semi-empirical equations of turbulent diffusion;

statistical approach to problems of turbulent diffusion; influence of stability (lapse rate) on turbulent diffusion; velocities for calculating of limiting turbulent diffusion; large-scale diffusion and future lines of development of theory along statistical lines. *Subject Headings:* **1. Turbulent diffusion 2. Turbulent diffusion applications.**—*M.R.*

11.8–194 551.511.6:551.558.1

Vasil'chenko, I. V., **Raschet kharakteristik oblachnoĭ konvektivnoĭ strui.** [Calculation of the characteristics of a convective current.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 82:22–25, **1958.** 3 refs., 17 eqs. **DLC**—In connection with an earlier study (*see* 10.6–176, June 1959, *Met. Abstr.*) in which approximate formulas for computing the fields of temperature, humidity and velocity in a stationary convective current in the atmosphere below the condensation level, and also the height of the condensation level were developed, the author develops similar formulas for the part of the convective current above the condensation level. Conceivably, the rise of air in the current above the condensation level in the presence of lateral turbulent exchange with a saturated environment should be accompanied, not only by condensation of water vapor, but also by evaporation of drops, which are transported during turbulent mixing at the periphery of the current. In this case the simplest example is considered when the relative humidity in the surroundings above the condensation level is 100%; an unsaturated zone within the current is absent under this condition. The author demonstrates the derivation of the velocity field of a cloud current in a saturated medium, namely

$$\omega_m^2 = \frac{3}{2}\frac{\lambda\beta}{d}\theta_m z - \frac{\lambda}{\Delta}\left(\frac{\beta+d}{d}\right)(\bar{\gamma}-\gamma_{ma})z^2$$

the temperature field

$$\theta = \left[xCz^{-5/3} + \frac{1}{4}\left(\frac{\beta+d}{\beta}\right)(\gamma-\gamma_{ma})z\right]e^{-dx^2}$$

and the field of relative humidity

$$x = \bar{q}\left(e^{\frac{L\theta}{AR_v\bar{T}^2}} - 1\right).$$

($\bar{T}$=temperature of the atmosphere; $\bar{q}$=saturated relative humidity of the atmosphere; A=thermal equivalent; L=latent heat of condensation; R_p=relative gas constant of water vapor; γ_{ma}=moist adiabatic gradient; $\theta = T(r,z)$, r and z=corresponding horizontal and vertical coordinates; T=temperature of current.) *Subject Heading:* **1. Convective currents.**—*I.L.D.*

GENERAL CIRCULATION

See also: **Index of zonal and meridional synoptic processes** (Kats), 11.8–159; **Numerical investigation of general circulation** (Bryan), 11.8–164; **Energy transformations in zonal circulation** (Monin), 11.8–186; **Typhoon frequencies in relation to circulation types** (Chang), 11.8–201; **Frontal structure of anticyclones** (Petrenchuk), 11.8–209; **Secular temperature variations and circulation** (Rusanov), 11.8–221; **Climatology of Central Asiatic Highlands** (Flohn), 11.8–291; **Paleoclimatic formation of pressure centers** (Borisov), 11.8–303.

11.8–195 551.513.1:551.558:525.3

Hollmann, Günther (*Offenbach/M.*), **Hitzewetterlagen als Kältemaschinen.** [Hot weather situations as cold-producing mechanisms.] *Naturwissenschaftliche Rundschau*, Stuttgart, 12(1):13–15, Jan. **1959.** fig. **DWB, DLC**—The author describes the process of indirect atmospheric circulation as manifested in a warm weather high, and direct atmospheric circulation in a low pressure area. The operation of the indirect circulation in the long period circulation between subtropic and subpolar latitudes, (between 30° and 60° lat.) is outlined. In the subtropics there is a high pressure area, the horse latitudes, with descending warm air, and at 60° lat. a trough of cold low pressure with ascending cold air. In the lower layers the air flows polewards, above equatorwards—but only in long period means between both lati-

tudinal zones. Direct circulation is limited to the tropic latitudes on the rotating earth. The trade winds are part of it. The magnitude of the vertical component of the vector of angular wind velocity is decisive for the influence of the earth's rotation upon the general circulation. The existence of a direct circulation of the Hadley type between equator and poles upon the entire rotating earth would have necessitated the assumption of enormous zonal wind components as a direct consequence of the area law that when the force components tangent to the latitudes disappear the area velocity of a meridionally displaced air mass measured absolutely on a latitude circle is conserved. In the case of air movement the distance of displaced air mass from the rotating earth alters. In middle and higher latitudes heat exchange is accomplished by the east and west movement of high and low pressure regions. They are rapidly moving; the former are characterized by descending cold air; the latter by ascending warm air. The direct circulation of the wandering high and low pressure regions drives the indirect circulation of the permanent high and low pressure regions. A schematic diagram representative of an indirect circulation with several direct circulations in the p-v diagram is presented. *Subject Headings:* **1. General circulation theories 2. Indirect circulation.**—*I.L.D.*

11.8–196 551.513.1:551.509.318

†Ped', D. A., **Opredeleniie granits makrosinopticheskikh protsessov pri pomoshchi indeksa tsirkuliatsii.** [Determining the boundaries of large-scale synoptic processes by means of a circulation index.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy,* No. 63:20–38, **1957.** 7 figs., 13 tables, 19 refs. **DLC**—A quantitative method for characterizing the development of large scale synoptic processes and determining their boundaries proceeding from an analysis of circulation conditions in the troposphere by using the (zonal) circulation index proposed by A. L. Kats is presented and described. The study was conducted on the basis of 500 mb charts for the morning in Dec., Jan., and Feb. 1951–1956 over the European USSR and adjoining areas (between 20°W and 30°E). *Subject Headings:* **1. Circulation indexes 2. Large scale weather processes 3. U.S.S.R.**—*A.M.P.*

11.8–197 551.513.1:551.524.32(98)

Petrov, L. S., **Nekotorye osobennosti termicheskogo rezhima zapadnogo sektora Sovetskoĭ Arktiki.** [Certain characteristics of the thermal regime of the western sector of the Soviet Arctic.] *Leningrad. Universitet, Uchenye Zapiski,* No. 269:85–95, **1959.** fig., 2 tables, 14 refs. **DLC**—The author examines the characteristics of the thermal regime of the Arctic winter known figuratively in the literature as "a non-nuclear winter"; by this term is meant the compact annual curve of atmospheric temperature during the winter months, absence of the midwinter minimum or its displacement towards the end of winter characteristic of other regions. This study is based upon monthly mean atmospheric temperature observations carried out at 18 stations on the Barents and Kara Seas. Analysis showed that warm nuclear winters (winters among which mean monthly temperatures rose in comparison with adjoining months) were more frequent than non-nuclear winters. The results of the study indicate the following: 70–80% of all the winters of Western Sector of the Soviet Arctic have a secondary atmospheric temperature maximum; this is a characteristic feature of the climate of this region. About 90% of the secondary winter maxima of atmospheric temperature occurs during Jan. and Feb. This percentage of winter temperature minima occurs in Jan. Feb. and March. Hence the averaged monthly mean temperature for a series of years also yields the notorious smoothed variation that is characteristic of the Arctic. The mean long period picture of the annual variation of temperature in the European Arctic does not reflect the real temperature conditions of this region. The winter temperature regime is characterized by sudden fluctuations of monthly mean temperature. The accepted term "non-nucleated winter" is incorrect: instead the term "heat nuclear winters" is preferred. The heat nuclearity of winters in the Arctic is associated with the definite forms of atmospheric circulation. The best condition for transport heat into the Barents and Kara Seas is the eastern circulation type (Vangengeim) characterized by well developed and westerly displaced anticyclone and no less developed Icelandic depression. The positive effect of heat nuclearity of winters is manifested in the supplementary heat received by the region—450–600° of heat in the average long period and up to 1500–2000° in individual years. A direct relationship was observed between the heat nuclearity of winters and the fluctuation of climate in the Arctic. The period of intense

warming (1920–1938) was associated with increased frequency of heat nuclearity of winters and increase of their intensity in comparison with periods of relative cooling. The warm nucleus is characteristic not only of the ground layer of the troposphere but also for a large part of its thickness; with height the intensity of the nucleus gradually decreases. *Subject Headings:* **1. Arctic winters 2. "Kernlose" winter 3. Soviet Arctic.**—*I.L.D.*

11.8–198 551.513.1

Vaisanen, Aimo (*Univ. of Helsinki*), **The general circulation in a symmetrical dishpan experiment.** Chicago. Univ. Dept. of Meteorology, Contract N60ri-02036, Report on Research [unnumbered], Jan. **1959.** 17 p. 10 figs., 3 tables, 9 refs., 28 eqs. **DWB** (M(051) C532ge)—Observations of the three-wave water movement in an improved dishpan are exploited in the theoretical model of the atmospheric pattern discussed here in terms of the zonal wind component, meridional wind component, angular momentum budget, kinetic energy balance and potential energy release. The results are consistent and satisfactory for the entire cycle. *Subject Headings:* **1. Dishpan experiments 2. Atmospheric circulation models.**—*W.N.*

ATMOSPHERIC DISTURBANCES

See also: **Corpuscular radiation effects on disturbances** (Macdonald, Roberts), 11.8–63; **Generation of microseisms** (Das Gupta), 11.8–118; **Probability of hurricane-force winds** (Kimball), 11.8–135; **Voluntary observers for thunderstorm studies** (Ludlam), 11.8–138; **Electric discharges from squalls and occlusion fronts** (Norinder, Knudsen), 11.8–141; **Cyclonic storm, Kurile Islands** (Svinukhov), 11.8–246; **Vertical atmospheric vortices** (Lacaze), 11.8–253; **Development of thunderstorm cloud** (Koldovský), 11.8–262; **Mackay storm, Feb. 1958** (Brunt), 11.8–272; **Biometeorological effects of prefrontal situations** (Benkő et al.), **11.8–313.**

11.8–199 551.515.11(265) 551.513.3(265)

Arkhangel'skiĭ, V. L., **Zimniĭ okhotskomorskiĭ tsiklon: sezonnyĭ tsentr deĭstviĭ atmosfery** [The winter Sea of Okhotsk cyclone: a seasonal atmospheric center of action.] *Meteorologiia i Gidrologiia*, Leningrad, No. 4:21–25, April **1959.** 2 figs., 2 tables, 10 refs. **DWB, DLC**—The author presents evidence of the statistical existence of a stable winter Sea of Okhotsk cyclone and defines more precisely the conditions established by Kh. P. Pogosian. For this purpose surface and high altitude maps for 10 winter seasons (December–February) beginning with the period 1948/1949 were used. Data are presented on the mean number of days with closed cyclonic isohypses on 500 mb maps and mean magnitudes of the absolute geopotential of the central isohypses of the 500 mb surface over the Sea of Okhotsk and over the Aleutian Archipelago during December–February for the period 1948/49–1957/1958 and the frequency of wind directions (in %) at Nagaevo from pibal observations for December–February 1934–1954. In December the mean number of days with cyclones aloft over the Sea of Okhotsk equals the mean number of days with such cyclones over the Aleutian chain and the adjacent parts of the Pacific Ocean and Bering Sea; in January the cyclones aloft are usually more frequent over the Sea of Okhotsk but in February their frequency is less by one day than over the Aleutian chain. The magnitude of the absolute geopotential of the 500 mb surface in the center of the Okhotsk cyclone is less during the three winter months than in the center of the Aleutian depression; an analogous situation is observed at the 300 mb surface. Furthermore the comparatively large frequency of southerly and southeasterly winds in the middle and upper layer of the troposphere over the northern coast of the Sea of Okhotsk indicate the statistical stability of the cyclone aloft over the Sea of Okhotsk. During the entire winter the extensive territory of the Amur basin and the right bank of the basin of the Lena River is characterized by the following two types of atmospheric processes, viz: 1) incursion of a nucleus of cold air from the north and northeast to Transbaikalia and farther to the eastern and central regions of Mongolia and northeastern regions of China. The anticyclones that are formed are low baric structures rarely exceeding the 700 mb surface; and 2) during the destruction of the incursion of the cold air process a frontal zone proceeds from Western Siberia across southern regions of Iakutia and the left bank of the Amur basin on the Sea of Okhotsk. *Subject Headings:* **1. Cyclone analysis 2. Cyclone-cold air mass relationships 3. Centers of action 4. Sea of Okhotsk.**—*I.L.D.*

11.8–200 551.515.2(961.3)

Blumenstock, David I. (*U.S.W.B., Honolulu*), **A note on hurricane frequencies in American Samoa, 1900 to 1939.** *American Meteorological Society, Bulletin*, 40(7):360–361, July **1959.** fig. **DWB, DLC**—A brief note containing information on hurricane tracks and frequencies in American Samoa over the period 1900 to 1939. The information was obtained from the annual Government Affairs folders in the office of the Governor of American Samoa at Pago Pago. From the tabulated information, it seems certain that there were at least five true hurricanes during the period 1900 to 1939 (1913, 1915, 1926, 1931, 1936). Probably there was one in 1907. Also, there were two tropical storms of less than hurricane intensity (March 1926 and 1939). A map also appears showing the four principal islands of American Samoa. *Subject Headings:* **1. Hurricane frequencies 2. Hurricane tracks 3. American Samoa.** *-I.S.*

11.8–201 551.515.2:519.24:551.513

Chang, Tsi-Tsia, **Mnogoletnie izmeneniia povtoriaemosti taifunov i ikh sviaz' s epokhal'nymi preobrazovaniiami form atmosfernoĭ tsirkuliatsii.** [Long period changes in the frequency of typhoons and their relation to secular transformation of atmospheric circulation types.] *Meteorologiia i Gidrologiia*, Leningrad, No. 11:24–27, **1958.** 3 figs., 2 tables, 3 refs. **DWB, DLC** -The author attempts to establish the law of the long term variation of the frequency of typhoons and its relation to secular transformation of atmospheric circulation (types W, C and E according to the VANGENGEIM classification). An integral curve of the anomalies of typhoon frequencies was constructed by comparing the annual number of typhoons with the normal for the period 1900–1954 and computing the magnitude of deviations which are added algebraically. The curve of long period variations of typhoon frequency runs almost parallel to the z zonal circulation type and inversely to type M_2=correlation coefficients of 0.976 and −0.952 respectively. The correlation coefficient between typhoon frequency and the Wolf number was −0.864. Again the integral curves of anomaly frequencies of typhoons for individual months (May–October) run parallel to the integral curve of the zonal circulation type z, for the corresponding month. A preliminary explanation of why an increase in the number of typhoons above the normal is associated with zonal circulation is presented. *Subject Headings:* **1. Typhoon frequencies 2. Secular circulation type transformations 3. Atmospheric circulation—typhoon relationships.**—*I.L.D.*

11.8–202 551.515.2

*Japan. Meteorological Agency, Tokyo, **Report of the Typhoon "Marie" (No. 5415), Sept. 1954.** *Its Memoirs*, 39(3), **1956.** 234 p. figs., tables. Articles in Japanese; English summaries. **DWB**—General aspect of typhoon Marie (No. 5415) of Sept. 1954 is described as follows: a typical depression formed in the Mariana area, developed over the sea of Philippines, and recurved over east Taiwan into a typhoon with speed of 100 km/h. Ch. I deals with distribution of total amounts of precipitation on Sept. 24–28 by region for every hour. In ch. II upper layer of Marie is analyzed on streamline charts at 1,500–10,000; 20,000–30,000 ft levels and at the two constant-pressure levels of 850 and 500 mb. Ch. III describes the weather conditions in various regions after the passage of the warm front, hourly movement of typhoon, distribution of minimum pressure and its isochrone, gale wind, streamlines, hourly rainfall, autographic records, barograms and thermograms. Ch. IV discusses the tides and the effect of the bottom topography and of the front of Marie, hourly and daily changes in various regions, tidal intensity and pressure, and wind speed. Ch. V concerns a statistics of damages caused by "Yamaji-Kaze," salt-wind-fields and conflagrations. In summary, some peculiarities are noted: (1) due to the southward intrusion of cold air into the sea of Japan and the northward flow of warm air along the Pacific coast of Japan, Marie became rapidly an extratropical cyclone; (2) due to the relay-like movement, the speed was abnormally great; (3) the greatest damage was to the region of Hokkaido. An appendix includes results of hourly surface observations in various regions. *Subject Headings:* **1. Typhoon reports 2. Typhoon "Marie" (1954) 3. Japan.**—*K.C.*

11.8–203 551.515.2:061.1(73)

Notes on the National Hurricane Project. *Weatherwise*, Boston, 12(4):154–156, Aug. **1959.** fig. **DWB**—The main points of the note are: 1. The first of 31 new high-powered

WSR-57 radar sets was installed in July in the Hurricane Research Center at Miami, Florida. The system is designed to locate and plot precipitation areas and associated meteorological phenomena within a radius of 250 miles from a fixed site. It has two functions, searching to locate storm and precipitation areas and analysis of storm areas. 2. Some agreements have already been made and others are in progress in connection with data collection. 3. Three weather reconnaissance airplanes are being outfitted with new instruments. 4. The construction of detachable weather recorders to be flown on the air weather reconnaissance planes from Bermuda has been completed. 5. The Weather Bureau is participating in a research program to investigate the mechanism whereby wind energy is transferred to the sea in the generation of waves and storm surges. 6. The Navy/Weather Bureau hurricane photographic rocket project will have ten complete heads available during the current season. 7. Plans are complete for a series of hurricane tracking beacon drops. 8. The National Hurricane Research Project headquarters is going to install a 650 computer. 9. An experimental analysis program is planned for the 1959 hurricane season. *Subject Headings:* **1. National Hurricane Research Project 2. United States.**—*K.C.*

11.8–204 551.515.21

U. S. Weather Bureau. National Hurricane Research Project, **Details of circulation in the high energy core of Hurricane Carrie.** *Its Report* No. 24, Nov. **1958.** 15 p. 14 figs., 9 refs. **DWB** (M15.2 U5845r) –The circulation features of a mature hurricane, Carrie, has shown that the striated distribution of wind speed, temperature and pressure are features common to most mature hurricanes. They are warm core storms but their kinetic energy decreases with speed; and the most intense gradients of temperature, wind, and pressure are concentrated in some narrow band about the center, extending from about 8 miles inside their eye wall outward through the wall cloud. Detailed data are included. *Subject Headings:* **1. Hurricane structure 2. Hurricane "Carrie" (1958).**—*N.N.*

11.8–205 551.515.3:616.24

Manos, Nicholas E. (*U. S. Public Health Service, Wash., D. C.*), **The tornado as an epidemiological research tool.** *American Meteorological Society, Bulletin*, 39(9):460–468, Sept. **1958.** 11 figs., 7 tables, 8 refs. **DWB** –The hypothesis that tornadoes spread histoplasmosis, a lung disease resembling tuberculosis, is supported by evidence based on a priori reasoning, by data from past records, and by data collected from a study designed to test this hypothesis. The less severe but much more frequent wind and rain storms might also be spreading this disease, although this is difficult to demonstrate. It may be possible to use future tornadoes as a "natural laboratory" to study the spread of the causative fungus and learn something about its survival and growth requirements in nature. *Subject Headings:* **1. Tornado effects on epidemics 2. Epidemiology.**—*Author's abstract.*

11.8–206 551.555.2:551.511:551.547.3

Mertsalov, A. N., **K voprosu o vzaimosviazi mezhdu divergentsieĭ vetra, izmeneniem vikhria skorosti i izmeneniem davleniia.** [The relationship between wind divergence, vorticity fluctuation and pressure change.] *Meteorologiia i Gidrologiia*, Leningrad, No. 4:16–20, April **1959.** 2 figs., 4 refs., 4 eqs. **DWB, DLC**—The empirically established fact that at the 700 mb surface wind divergence may be accompanied by a rise in pressure and wind convergence by a drop in pressure has led to regarding wind divergence in the middle troposphere as an index of rise in pressure and wind convergence as an index of pressure drop. The paradoxicality of the relationship between divergence-convergence of wind and pressure change is increased if one considers the concept derived from the equation of vorticity that wind divergence is a factor of increase of anticyclonicity (or decrease of cyclonicity) and convergence is a factor of increase of cyclonicity (decrease of anticyclonicity) of circulation with time. The wind convergence at the 700 mb surface is not the cause but only the formal sign of a pressure fall; analogously the wind divergence of this surface, in most cases accompanied by a more powerful convergence or predominant cold advection in other layers, is only a sign of an increase in pressure. In considering the possibility of the establishment of a simple circulation in a

considerable atmospheric thickness in the case of a varying sign of wind divergence at different elevations, the author assumes that the advection of vorticity is completely absent along any vertical axis. The equation

$$\frac{\partial \Omega}{\partial t} + \left(w_0 + k_0 z + \frac{a}{2} z^2\right) \frac{\partial \Omega}{\partial z} + a/z - lk_0 = 0$$

is derived (k_0 = wind convergence at the initial level, a = amount of decrease of wind convergence with height, w_0 = vertical velocity at initial level, l = coriolis parameter, z = height). If at any moment ($t=0$) the vortex velocity varies linearly with height then

$$\Omega(z,t) = \Omega(0,0) - 2l \ln \frac{2Me^{Mt/2}}{az - k_0 + M - (az - k_0 - M)e^{Mt}} - \frac{n}{a} \frac{(M+k_0)(az - k_0 + M) + (M - k_0)(az - k_0 - M)e^{Mt}}{az - k_0 + M - (az - k_0 - M)e^{Mt}}.$$

This expression is true for any layer or any direction in which the linear variations of wind convergence vary with height, the convergence is constant for a fixed level, the vortex of wind velocity at any moment varies linearly with elevation at any moment and advection of vorticity is absent. The partial derivative of the vorticity with time is written as follows:

$$\frac{\partial \Omega(z,t)}{\partial t} = -lM \frac{az - k_0 + M + (az - k_0 - M)e^{Mt}}{az - k_0 + M - (az - k_0 + M)e^{Mt}} - \frac{2nM^2(az - k_0 - M)(az - k_0 + M)e^{Mt}}{a[az - k_0 + M - (az - k_0 - M)e^{Mt}]^2}.$$

The distribution of wind convergence-divergence with height is represented by diagrams and analyzed with these formulas. *Subject Headings:* 1 **Divergence computation** 2 **Vorticity calculations.**—*I.L.D.*

11.8–207 551.515.31

Rossmann, Fritz O. (*Alamogordo, N. M.*), **On the physics of tornado processes.** Alamogordo, New Mexico, Dec. **1958.** 16 p. 7 figs., 2 tables, eqs. **DWB** (M15.3 R837on)—It is entirely the inside vertical motion of the vortex of a tornado or waterspout which possesses the destructive power. When this almost vertical jet hits the surface with a tremendous kinetic energy, which increases by converging, the pressure difference (Bernoulli's eq.) explodes buildings, the debris acts like shrapnels and the dynamic pressure of the wind completes the destruction. The general equat on of atmospheric motion without friction proves the subordinate role of horizontal energy supply and several photos illustrate the inside downward, outside upward doughnut-shaped movement of the contacting trunk, which is treated quantitatively. The results are tabulated and demonstrate the influence of hail on pressure drop. *Subject Heading:* **1. Tornado dynamics.**—*W.N.*

11.8–208 551.515.8:551.577.32

*Gregor, Alois and Gregor, Zdeněk (*both, Met. Inst. of Charles Univ. and Hydrometeorological Inst. Prague*), **Niederschlagsänderungen während eines Jahres in ihrer Beziehung zu den Frontalzonen.** [Variations of precipitation during a year as related to frontal zones.] *Studia Geophysica et Geodaetica*, Prague, 2(4):362–396, **1958.** 18 figs., 9 tables, 16 refs., eqs. Russian summary p. 396. **DWB**—This study deals with an examination of the course of the position and intensity of frontal zones in the Northern Hemisphere on the basis of the monthly variation of precipitation amounts. It is assumed that precipitation defines the boundaries of frontal zones as well as the form and direction of their axes. In the analysis orographic precipitation was not considered. The extent to which convective precipitation increases the role of frontal precipitation is examined on the basis of several typical examples in moderate subtropical regions represented by localities along the line Thorshavn–Jerusalem. The convective precipitations were identified, as a rule, as thunderstorm precipitation and in summer their contribution amounted to 50 to 80%. *Subject Headings:* **1. Frontal zone varia-**

tions 2. Precipitation over Northern Hemisphere 3. Northern Hemisphere.—*Based on author's conclusions.—I.L.D.*

11.8–209 551.515.8:551.515.72

§Petrenchuk, O. P., **Frontal'naia struktura antitsiklonov.** [Frontal structure of anticyclones.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 82:45–67, **1958.** 13 figs., 4 tables, 11 refs. **DLC**—The author presents a detailed study of the frontal structure of anticyclones and its change with time on the basis of ten cases of moving and stationary summer and winter anticyclones. Detailed analyses are presented of two moving and two stationary anticyclones. For each of the anticyclones investigated the maps of the synoptic situation, vertical sections of the atmosphere, data on the horizontal contrast of temperature in degrees in the direction normal to the cold front at various distances from the ground and composite diagrams of the position of the frontal surface in the anticyclone and above it in its various stages of development are presented. The results of the investigations demonstrate the following: in the first stage of development of an anticyclone when it is in a homogeneous, usually cold, air mass, there exists in the free atmosphere above it a considerable temperature contrast which frequently maintains itself within the limits of the entire troposphere. Aloft, above the anticyclone, a curved frontal surface occurs. During the process of development of the anticyclone a temperature heterogeneity appears in the upper layers. The vertical thickness of cold air diminishes considerably in it as a result of heat advection and also of descending motion. In addition a deformation of the frontal surface occurs; this manifests itself as a diminution of its angle of inclination and of its transformation into a horizontal surface. Beginning with a uniform stage of development stable layers, 3000–4000 m thick, appear in the anticyclone and above; they appear as a transitional zone of high altitude fronts. As the anticyclone develops, the vertical extent of stable layers within it decreases, but at the same time the thickness of the inversion layer increases beginning usually from the surface of the earth. It can be explained by the settling of the stable layers. *Subject Headings:* **1. Anticyclone structure 2. Frontal structure of anticyclones.**—*I.L.D.*

11.8–210 551.515.81

Sasak , Yosh kazu (*Agric. & Mech. College, Texas*), **A numerical experiment of squall-line formation.** *Journal of Meteorology*, Boston, 16(4):347–353, Aug. **1959.** 11 figs., 14 refs., 32 eqs. **DWB, DLC**—The formation of a prefrontal squall line is studied, based on a numerical method of solving the modified equation of motion, continuity (mass and moisture content), and thermodynamics simultaneously. Due to the limited capacity of the electronic computer used (IBM 650), computations in this experiment are necessarily simplified, and this preliminary study is made for two idealized cases both of which consider conditions in advance of an intense cold front. The first case treats moist air at low levels with dry air aloft; the second considers a strong southerly jet-like flow at low levels. From results obtained, it is shown that a significant factor for squall-line formation is the unbalance between thermal wind and actual wind shear. Also, the role of a strong southerly flow at low levels is indirect and appears to be that of supplying moisture from ocean areas. *Subject Headings:* **1. Squall line formation 2. Equations of motion.**—*Author's abstract.*

11.8–211 551.515.83

§Brown, G. Bruce, **A generalized concept of frontogenesis.** Mass. Institute of Technology. Dept. of Meteorology, Contract AF 19(604)-1305, Scientific Report No. 3, March **1958.** 52 p. 6 figs., 9 tables, 31 refs., 7 eqs.—The theory of frontogenesis or development vector is discussed including the more salient contributions of other workers. The non-conservative and the kinematical composition are treated, the former by the meteorological equations, the latter by equations derived in the case of latent heat. Application of the frontogenesis vector to frontal zones where it becomes discontinuous is considered. The second part is devoted to "Measurements of the horizontal components of the frontogenesis vector for potential temperature," based on eastern U. S. 850 mb charts for the cyclone of March 1956. The method involves smoothing of the variables but is objective. Bjerknes's graphical method is included. Good agreement between observed and computed changes is shown. *Subject Heading:* **1. Frontogenesis.**—*W.N.*

RADIATION AND TEMPERATURE

RADIATION

See also: **Radiation and particle precipitation from solar flares** (Bierman, Lüst), 11.8–58; **Corpuscular radiation effects on disturbances** (Macdonald, Roberts), 11.8–63; **Spectroscopic study of night airglow** (Shuiskaia), 11.8–102; **Calculation of reflectivity** (Matuliavichene), 11.8–139; **Effect of smoke on illumination** (Fedorov), 11.8–171; **Heat balance of troposphere** (Kasten et al.), 11.8–188; **Temperature changes in Antarctic** (Wexler), 11.8–229; **Condensation by ultraviolet light** (Barnard, Mouton), 11.8–256; **City temperature and anomalous lateral refraction** (Ziuzin), 11.8–312; **UV radiation effects on plant growth** (Brodfűhrer), 11.8–314; **Light effect on marine life** (Korringa), 11.8–319; **Bibliography on whiteout** (Harker), 11.8–322. For cosmic radiation *see:* **Sec. D1**, p. 1227.

11.8–212 551.521:551.524.4:551.573:634.94

Rauner, Iu. L., **Issledovanie teplovogo i vodnogo balansa molodogo sosnovogo lesa.** [Investigation on the thermal and water balance of a young pine forest.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geografich.*, No. 4:136–139, July/Aug. **1959.** fig., 3 refs., 5 eqs. **DWB** – The author examines very critically the study by A. Baumgartner **Untersuchungen über den Wärme- und Wasserhaushalt eines jungen Waldes**—(*see* 8D–103, April 1957, *Met. Abstr.*). Various errors made in this study are pointed out. The greatest objection is to the use of thermographs for determining temperature gradients used to compute turbulent heat exchange. Owing to dissimilar ventilation conditions at different levels the daily temperature values would be elevated in comparison with those at higher levels. Systematically higher measured vertical temperature gradients hence arise. Less successful is the determination of absolute humidity, not by direct measurement but by computation from temperature and relative humidity. The amount of computed radiation and the radiation balance was 15–18% higher than in the same season of the year and using similar weather in the irrigated oasis of Central Asia situated considerably south of Munich. The computation of turbulent heat exchange, L, was carried out by the method of turbulent diffusion, i.e. with preliminary determination of the roughness parameter z_0 of the forest and the "displacement layer" z' on the basis of measl urements of profiles of wind velocity above the forest during adiabatic conditions. The wel-known formula of the logarithmic wind law, namely

$$u_a(z) = \frac{u_a}{x} \cdot \ln\,(z+z_0+z)' = \frac{u_a}{x} \cdot \ln \frac{z-d}{za}$$

is not clearly treated; here $u_a(z)$ = wind velocity at height z during adiabatic conditions, u_a = velocity of friction during the same conditions, $x = 0.45$ (von Kármán constant), $d = z_0 - z'$. The determination of z and z' by the author involved the use of a vertical profile of a very weak wind velocity in which the logarithmic distribution approached the linear. The value of turbulent heat exchange was computed through the velocity of friction with the correction for stratification by the equation

$$L = \frac{C_p \cdot \rho x^2 \cdot \Delta u_a - \Delta\theta}{b^2(1+x)^2}\ [\text{cal/cm}^2\text{/min}]$$

where C_p = specific heat capacity of air, ρ = density of air, $\Delta\theta$ = potential temperature difference between 5.1 and 10 m, $(1+x)^2$ = correction for stratification as a result of uncorrected z'. The value of L is too high. *Subject Headings:* **1. Forest microclimatology 2. Heat balance measurements 3. Heat exchange in forests.**—*I.L.D.*

11.8–213 551.521.1:551.577:551.571:551.573

Evseev, P. K., **Sviaz' atmosfernykh osadkov s summarnoĭ radiatsieĭ, ispareniem i absoliutnoĭ vlazhnost'iu.** [The connection between atmospheric precipitation and total radiation, evaporation and absolute humidity.] *Meteorologiia i Gidrologiia*, Leningrad, 10:18–23, Oct. **1958.** 2 figs., 2 tables. **DWB, DLC**—The relationship between the annual variation of shower and drizzle rainfall and total radiation, local evaporation and absolute humidity is examined on the basis of data for the European U.S.S.R. for the period 1936–1954. The characteristics of shower and drizzle rainfall and the factors involved in their formation are

summarized. The correlation coefficient between shower rainfall and drizzle rainfall respectively and total solar radiation indicates that the former has a high positive correlation except for Murmansk and the latter has a negative correlation. This points to the fact that a close relationship exists between air masses and underlying surface with rainfall but that the formation of drizzle is independent of the underlying surface where the rain falls. A direct and very close relationship is found between local evaporation and showers while drizzle has no direct relationship with local evaporation but the inverse relationship is unstable and the negative correlation coefficient varies considerably (from −0.400 to −0.925). A very close relationship exists between showers and absolute humidity over the entire USSR except in Central Asia; drizzle is negatively correlated with absolute humidity over the entire European USSR and Central Asia; the negative correlation coefficients vary considerably with the absolute humidity; in regions with monsoons and prevailing anticyclonic weather in winter there are large positive correlations between drizzle and absolute humidity. *Subject Headings:* **1. Precipitation-evaporation ratio 2. Precipitation-radiation relationships 3. Precipitation-humidity relationships.**—*I.L.D.*

11.8–214 551.521.1(73)

Elliott, J. F. (*Advanced Semiconductor Lab., Gen. El. Co., Syracuse, N. Y.*), **The minimum average daily solar radiation in the United States during December for a tilted flat-plate collector.** *Solar Energy*, Phoenix, Ariz., 3(2):35–36, April **1959.** figs., table, 5 refs. **DWB**—The minimum average daily solar radiation in the United States during the month of December for a tilted flat-plate collector is presented by means of lines of constant radiation density on a map. Such data are useful in determining the economic feasibility of photovoltaic power generating systems where a given daily demand power is required. *Subject Headings:* **1. Solar radiation data 2. Solar energy estimation 2. United States.**—*Author's abstract.*

11.8–215 551.521.11:551.588.2(234.42)

†Stenz, Edward and Słomka, Jan, **Niektóre dane o promieniowaniu słonecznym w Karpatach, Sudetach i ich przedgórzu.** [Some data on insolation in the Carpathians, Sudetes and their foreland.] *Acta Geophysica Polonica*, Warsaw, 7(1):12–24, **1959.** 2 figs., 7 tables, 22 refs. English summary p. 23–24. **DWB, DLC**—The major part of the pyrheliometric measurements and their results presented and discussed here were conducted 1903–1940/41. However the first representative measurements commenced Sept.–Nov. 1909 on Polonina Pożyżewska (1372 m). These and subsequent measurements were conducted by Stenz at different altitudes at several locations. The first measurements in winter likewise were conducted by the same author, commenced Jan. 1933 in the Tatra mountain range, and include some measurements by other workers elsewhere in Poland. The discussion includes annual development of insolation in mountains and a comparison with the lowland. For example at the same elevation, the mean values of the Eastern Carpathian foreland are 0.1 cal cm^{-2} min^{-1} higher than those in Warsaw. Słomka supplies data from measurements conducted in 1950–1957. *Subject Headings:* **1. Solar radiation data 2. Poland.**—*W.N.*

11.8–216 551.521.14:551.521.18

Kozyrev, B. P. and Vershinin, O. E., **Opredelenie spektral'nykh koeffitsientov diffuznogo otrazheniia infrakrasnoĭ radiatsii ot zachernennykh poverkhnosteĭ.** [Determination of spectral coefficients of diffuse reflection of infrared radiation from blackened surfaces.] *Optika i Spektroskopiia*, Moscow, 6(4):542–(549), April **1959.** 9 figs., 17 refs., 11 eqs. **DLC.** Transl. into English in *Optics & Spectroscopy*, N. Y., 6(4):345–350, April **1959.** 9 figs., etc. **DLC**—A method is discussed of determining coefficients of diffuse reflection where scattered radiation is focussed on the receiver surface by means of a mirror hemisphere. This method can be employed to determine the absolute values of reflection coefficients if the losses of the reflected energy are eliminated. A description is given of the measuring apparatus which allowed the determination of the spectral coefficients of specular and diffuse reflection in the infrared region. Measurements were made of the spectral coefficients of reflection from metallic surfaces coated with different kinds of carbon black, Bi, Zn, Te, Sb blacks and other absorbing substances. *Subject Headings:* **1. Spectral reflectance measurements 2. Diffuse reflectance measurements.**—*Authors' abstract.*

11.8–217 551.521.3

Riabova, E. P., **Nekotorye osobennosti oblucheniia grebnistoĭ poverkhnosti pochvy priamoĭ solnechnoĭ radiatsieĭ.** [Some features of the irradiation of a ridged soil surface by direct solar radiation.] *Meteorologiia i Gidrologiia*, Leningrad, No. 11:11–17, **1958.** 3 figs., table, 9 refs., 7 eqs. **DWB, DLC**—The author derives equations for determining the relationship of amounts of solar radiation incident per unit time and surface on a ridged and even surface (q) and the difference between these quantities (ΔS). These equations are

$$q = \frac{\vec{in}_{1,2}}{\vec{in}_0} \quad \text{and} \quad \Delta S_{1,2} = l(\vec{i}, \vec{n}_{1,2} - \vec{in}_0)$$

where l = amount of radiation incident in unit time and unit surface perpendicular to the rays; $n_1 n_2$ = loci of normals to the east and west sides of a ridge surface; n_0 = locus of the normal to an even surface; i = locus of direction of solar radiation. Equations giving the dependence of $n_1 n_2$ upon time and for determining the time of beginning of radiation are derived. The results of computations for Leningrad Oblast ($\gamma = 60°$) are presented. The irradiation of a ridged surface by direct solar rays is uneven because of shading by other ridges. The upper portion of a ridge is irradiated most intensely; however, for latitude $\gamma = 60°$ the influence of shading is negligible. In all azimuths one side of a ridge receives more radiation in the beginning of insolation (both relative and absolute) than an even surface. In some azimuths the ratio of amount of radiation incident on a ridged and even surface may increase without limit, but large values of this magnitude are not typical. A more important comparative characteristic is the difference between the absolute amount of radiation incident upon a ridged and even surface. From this point of view the most suitable direction of the ridge is north-east to south-west. *Subject Heading:* **1. Radiation on ridged surfaces.**—*I.L.D.*

11.8–218 551.521.3:535.23

Winskell, P. L. and Hsu, S. T. (*both, Dept. of Mech. Eng., Wisc. Univ.*), **Theory and design of a mechanical blackbody for solar radiation.** *Solar Energy*, Phoenix, Ariz., 3(2):1–8, April **1959.** 16 figs., 2 tables, eqs. **DWB**—A method of increasing the absorptivity of a metallic surface by a mechanical arrangement of the surface is discussed in the paper. The theoretical absorptivities obtained as a result of varying such physical parameters as surface length, distance between surfaces, surface absorptivity, and angle of incidence of radiation are stated. An experimental heat exchanger and a mechanical blackbody surface are evaluated relative to a comparative heat exchanger and a coated black surface. An apparent increase in absorptivity is seen as the net heat transfer rate occurring with the mechanical blackbody (material absorptivity of 0.5) is 90% of the rate obtained with the black surface. *Subject Heading:* **1. Solar energy collector surfaces.**—*Authors' abstract.*

TEMPERATURE

See also: **Thermal index of maize growth** (Chirkov), 11.8–32; **Heat requirements of maize** (Kalmykova), 11.8–33; **Heat requirements of wheat** (Mel'), 11.8 34; **Heat requirements of sunflower** (Smirnova), 11.8–35; **Frosts in Byelorussia** (Peryshkin), 11.8–168; **Spring and autumn frosts in Azerbaidzhan** (Strakhov, Filippova), 11.8–169; **Interlatitudinal exchange of air masses in stratosphere in winter** (Zubian), 11.8–185; **Heat balance of troposphere** (Kasten et al.), 11.8–188; **Thermal regime, Soviet Arctic** (Petrov), 11.8–197; **Thermal and water balance of pine forest** (Rauner), 11.8–212; **Temperature fluctuations over heated surface** (Townsend), 11.8–239; **Rainfall probabilities, Michigan** (Baten et al.), 11.8–269; **Summer temperatures, Czechoslovakia** (Petrovič), 11.8–298; **Height distribution of temp., Uvira** (Weis), 11.8–299; **Paleotemperatures and abyssal fauna** (Birstein), 11.8–302; **Temperature field in a city** (Ziuzin), **11.8–312; Effective temperatures, East Germany** (Seifert), 11.8–315.

11.8–219 551.524.31(98)

Hisdal, V. (*Norwegian Polar Inst., Oslo*), **The diurnal temperature variation during the polar night.** *Royal Meteorological Society, Quarterly Journal*, 86(367):104–106, Jan. **1960.** fig., 5 refs. **DWB, DLC**—It is well known that if special types of days are considered sepa-

rately, systematic diurnal temperature variations may be found to exist at polar stations even during the dark season. In the present paper it is shown that, in all probability, this phenomenon is of trivial nature and that a perfectly simple explanation of its origin is possible. *Subject Headings:* **1. Diurnal temperature variations 2. Polar temperatures.**—*Author's abstract.*

11.8–220 551.524.32(437)

Petrovič, Št. and Karský, Vladimír, **Príspevok k ročnému chodu teploty vzduchu v Československu.** [Annual variation of atmospheric temperature in Czechoslovakia.] *Meteorologické Zprávy*, Prague, 11(4/5):108–112, **1958.** 5 tables, 6 refs. Russian summary p. 108. **DWB, DLC**—Monthly mean values of atmospheric temperature are presented for selected stations in Czechoslovakia for the period 1901–1950. It is shown that extremes in the Tatra mountains occur later than elsewhere; the minimum in February and the maximum in August. Changes in the amplitude of temperature variations are considered as functions of elevation and topography. Variations of thermal continentality with distance from the sea are analyzed according to GORCZYŃSKY's continentality index. Changes in temperature are also evaluated by means of relative temperatures, which revealed the sudden warming in spring in the eastern part of the country. *Subject Headings:* **1. Temperature data 2. Continentality 3. Climate of Czechoslovakia 4. Czechoslovakia.**—*Transl. of authors' abstract.*

11.8–221 551.524.34(571):551.513:523.74

Rusanov, V. I., **Mnogoletniĭ khod temperatury vozdukha v Tomske.** [Secular variation of atmospheric temperature in Tomsk.] *Priroda*, Moscow, No. 8:86–88, Aug. **1958.** fig., table. **DLC**—The secular variation of atmospheric temperature in Tomsk is analyzed on the basis of data for 128 years, during which the period 1873–1957 was continuous, in order to determine whether climatic change has occurred and especially whether the air temperatures of January, July and the annual mean have altered. Data are presented in the text and in a table on the maximum, minimum, and 100-year mean temperatures for these months, on the annual means during this period and on the frequency of particular ranges of deviations of mean monthly and mean annual air temperatures from the mean secular temperature. An analysis of a graph of deviation of sliding mean temperatures (smoother for ten year periods) from the secular mean shows that judging from the annual means, some warming began in the 1880's and has continued until the present. The warming tendency is evident in the January data and to a lesser extent in the July data. The greatest warming occurred in the 1920–1930's. The reason for the warming is attributed to the character of atmospheric circulation, which depends upon solar activity. The high winter temperatures in Tomsk are always the result of incursions of warm tropical air masses. *Subject Headings:* **1. Temperature trends 2. Secular temperature variations 3. Tomsk, Siberia.**—*I.L.D.*

11.8–222 551.524.36(434.1)

Fischer, Rudolf (*Darmstadt*), **Kalte und milde Winter nach Anzahl der "Eistage" in Frankfurt a.M.** [Cold and mild winters according to the number of ice days in Frankfurt a.M.] *Naturwissenschaftliche Rundschau*, Stuttgart, 12(9):351–352, Sept. **1959.** Table. **DWB, DLC**—The so-called "ice days" are a measure of winter severity. These are defined as the days on which the air temperature does not rise above freezing. The "ice days" can occur between November 1 and March 31. The average number in this period amounts to 19. The winters of Frankfurt a.M. have been classified into 6 groups on the basis of ice days: 1. severe winters $\geq$36 ice days; 2. cold winters 25–35 ice days; 3. rather cold winters 18–24 ice days; 4. moderately cold winters 11–17 ice days; 5. mild winters 7–10 ice days; 6. very mild winters 0–6 ice days. A table giving the winters from 1826–1827 to 1946–1947 on the basis of ice days is presented and the variation of the winters during this period is discussed. *Subject Headings:* **1. Winter temperatures 2. Freezing days 3. Frankfurt a.M., West Germany.**—*I.L.D.*

11.8–223 551.524.36:631.67

Matějka, Vladimír, **O vlivu zalévání na noční přízemní teploty.** [Effect of irrigation upon surface temperature at night.] *Meteorologické Zprávy*, Prague, 11(6):149–152, **1958.**

4 tables, 13 refs. Russian and German summaries, p. 149. **DWB, DLC**—Comparative data are tabulated on minimum temperatures at night over intensely and slightly irrigated, and unirrigated plots of bare soil (2 series of 15 comparative measurements each, April, May and Oct. 1957). The average minimum temperature increase due to irrigation was 0.7°C at 1 cm over the ground; over porous dry soil minimum temperature increases by as much as 1.6°C were measured. The irrigation effect decreases rapidly with height above the ground. *Subject Headings:* **1. Irrigation effects on temperature 2. Surface temperature variations 3. Minimum temperatures.**—*G.T.*

11.8–224 551.524.36:519.24(497.1)

*Penzar, Branka, **Temperaturna klasifikacija Zagrebackih zima.** [Temperature classification of winter in Zagreb.] *Zagreb. Sveučilište. Geofizički Institut, Radovi*, Ser. 3, No. 9, **1957.** 28 p. 8 figs., 11 tables, 14 refs. German summary, p. 23–28. **DLC.** Review in *Weather*, London, 14(1):34, Jan. **1959. DWB**—The 95 year uninterrupted temperature record (1862–1956) of the Zagreb-Grie Observatory was statistically analyzed, using Chapman's criterion for departures. The very detailed results are presented in histograms, diagrams and tables. Zagreb winters last from Nov. through March. January is the coldest month. 56% of the winters were completely normal (i.e. with normal, − and + sums). On the average, each 7th winter was abnormally cold, each 6th winter abnormally warm. A sudden warming up of winters began in 1900, culminating in the twenties when a trend toward colder period began. Correlation between Central European synoptic situations and Zagreb winters is discussed. *Subject Headings:* **1. Winter temperatures at Zagreb 2. Statistical analysis of temperature 3. Zagreb, Yugoslavia.**—*W.N.*

11.8–225 551.524.36(261):519.241.1

Rosenthal, Stanley L. (*Fla. State Univ.*), **A method for computing surface-air temperature frequencies over the North Atlantic Ocean.** *Journal of Meteorology*, Boston, 16(5):573–580, Oct. **1959.** 5 figs., 15 tables, 4 refs., 5 eqs. **DWB, DLC**—A set of regression equations, which relate the 05, 25, 50, 75, and 95 percent points of the surface-air temperature frequency distributions over the North Atlantic Ocean to mean temperatures interpolated from charts contained in the U. S. Navy Marine Climatic Atlas of the World, Vol. I, North Atlantic Ocean, is obtained. With these equations and the previously mentioned climatic atlas, one can estimate the surface-air temperature frequency distribution at any given point over the North Atlantic Ocean. Tests conducted with independent data indicate that the equations give accurate results. *Subject Headings:* **1. Temperature at sea 2. Temperature frequency distribution data 3. Regression equations 4. North Atlantic.**—*Author's abstract.*

11.8–226 551.524.4(438.3)

Milata, Stanisława (*Kraków*), **Częstotliwość inwersji względnych temperatury powietrza w Krakowie w latach 1954, 1955 i 1957.** [Frequency of relative air temperature inversions in Kraków in 1954, 1955 and 1957.] *Przeglad Geofizyczny*, Warsaw, 4(1):19–37, **1959.** Graph, 21 tables, 5 refs. English summary, p. 37. **DWB, DLC**—Comparative results of air temperature measurements at Kraków and Libertow (distance 10 km, difference in elevation, 87 m) are presented in tables. A temperature difference of 0°C was considered as a case of inversion. For the years 1954, 1955 and 1957 a yearly mean of 256 inversions was obtained from three terminal observations a day. Taking into account also the readings of extreme diurnal temperatures, a yearly average of 200 days with air-temperature inversion was found. Inversion duration was from 6–10 hours in 66, and over 10 hours in 98 cases. In Kraków inversion occurred mostly in the morning hours and in the evening, when it frequently lasted all night. Inversion intensity is generally greater in winter than in autumn, but this can not be regarded as a rule. The inversions occurring in the years 1954 and 1955 were divided in two types; radiative, and advective frontal. In analyzing the statistical results author finds that temperature inversions are frequent in Kraków owing to the site of the city in the Vistula river valley which is enclosed by hills on three sides. Prolonged duration of inversions is caused by fumes as is shown by the phenomenon of advective inversions changing into radiative inversions, though advection has ceased. Another interesting conclusion is the fact that during inversion time calm prevails in only 2.2% of the cases in Kraków, but in 45.3% of the cases

at the observatory situated above the city. Hence the deduction (confirmed also by mobile patrols) that during inversion time there is in Kraków a flow of air from W to E, directed by the Vistula valley. Author evaluates the height of the inversion as from 60 to 80 m above city level. *Subject Headings:* **1. Temperature inversion frequencies 2. Kraków, Poland.**—*Author's summary.*

11.8–227 551.524.4:551.571.4

Rákóczi, Magdolna (Wágner), **A talajközeli légréteg hőmérsékleti és nedvességi gradienseinek vizsgálata.** [Investigation of temperature and humidity gradients in the atmospheric layer near the ground.] *Időjárás*, Budapest, 63(1):36–37, Jan./Feb. **1959.** Fig., 3 tables, 10 refs. **DLC**—Temperature, humidity and wind gradient measurements (20 and 200 cm) were made at three stations near Lake Balaton at hourly intervals between 6 a.m. and 6 p.m. from July 29 to Aug. 23, 1958. There were considerable differences in the topographic character of the locations of each station and the purpose of the study was to determine the influence of topographic difference and of weather type upon the gradients of weather elements. Summary data are presented. Wind conditions are found to be the decisive factor in the development of temperature and humidity gradients in the lowest 2 m. Geomorphological differences by themselves do not appear to have a significant effect even in conditions involving radiation. *Subject Headings:* **1. Temperature gradient near the ground 2. Humidity gradient near the ground 3. Wind effects on microclimate.**—*G.T.*

11.8–228 551.524.7:551.571.7:681.143

Killen, Gwendolyn and Evenson, Leonard E., **Calculator for temperature-humidity computation.** *U. S. Signal Research and Development Lab., Ft. Monmouth, N. J., Technical Report*, 2010, Nov. 24, **1958.** 31 p. 10 figs., 4 refs., 21 eqs. **DWB** (M(055) U582us)—Measurement of atmospheric humidity and temperature from aircraft using a stagnation-type measuring system with a resistance-type humidity sensor, such as Humidity-Temperature Measuring Set AN/AMQ-7 and Humidity Element ML-476( )/AMT, presents computational problems in reducing the readout data to true free-stream values. The theory, design criteria, and operation of a circular slide-rule type calculator designed to facilitate these computations are described. The device simply and effectively provides for a lock-in adjustment for the humidity sensor, conversion of the output function of this sensor to dewpoint temperature, and application of the necessary aerodynamic corrections to the indications from the measuring set. Pressure altitude and calibrated airspeed (or Mach number) are used in the computations. The final readout gives the true free-stream conditions of temperature and dewpoint temperature. The calculator is intended for use at aircraft speeds below Mach number 1.0. By modification of the appropriate scales, the design can be easily adapted for use with other equipments of similar design. *Subject Headings:* **1. Upper air temperature calculations 2. Airborne temperature recorders 3. Upper air humidity data.**—*Authors' abstract.*

11.8–229 551.524.7:551.524.32:551.581:551.587:551.521.32(99)

†Wexler, Harry (*U. S. W. B., Wash., D. C.*), **Seasonal and other temperature changes in the Antarctic atmosphere.** *Royal Meteorological Society, Quarterly Journal*, 85(365):196–208, July **1959.** 16 figs., table, 23 refs. **DWB, DLC.** Transl. into Russian as **Kolebaniia temperatury v atmosfere nad Antarktikoĭ,** in *Meteorologiia i Gidrologiia*, Leningrad, No. 3:10–24, March **1959.** 16 figs., table, 21 refs. **DWB, DLC. Discussion** on the original English by L. C. W. Bonacina et al. and **Reply** by Wexler in *R. Met. Soc., Q. J.*, 86(368):283–287, April **1960.** Additional **Discussion** in *Die Umschau*, Frankfurt a.M., 60(12):364–365, June 15, **1960.**—The annual variation of temperature in Antarctica has interesting properties: it is largest in the stratosphere (50° to 60°C), smaller at the surface (20° to 40°C) and smallest in the troposphere (10°C). During the winter night the troposphere temperature decreases only slightly while the stratosphere temperature drops steadily at about ¼°C per day. This differential cooling which weakens and at times wipes out the tropopause, is caused, on the one hand, by intense horizontal advection of maritime air into the Antarctic troposphere, and, on the other hand, by very little advection through the strong stratospheric jet stream encircling Antarctica. This ventilation of the Antarctic troposphere by warm marine air causes large portions of Antarctica to exhibit the "kernlose" winter-temperature curve instead of the sharp winter

minimum usually found in polar continental climate. Anomalously high June temperatures in the lower troposphere at Little America are attributed to intense cyclones which form in the Ross Sea area and advect air from the lightly ice-clad or open ocean located not too far north of the Ross Sea. Large deviations in average monthly temperatures are found in the Ross Sea area which are undoubtedly a reflection of large year-to-year circulation changes in that area. The Antarctic and Arctic stratospheres exhibit quite different temperature behaviours after the winter solstice. The Antarctic stratosphere continues to cool until the sun returns and then warms as much as 50°C in 1 month. On the other hand, the Arctic stratosphere exhibits a warming of 30° to 40°C, sometimes beginning 6 weeks before the sun returns. A secular trend of temperature since 1912 of +2.6°C at Little America (78°12′S, 162°15′W) compares with a +6.2°C trend at Spitsbergen (78°04′N, 13°38′E). Finally, temperature and outgoing radiation observations made at the South Pole I.G.Y. Station during the cold period of 19–24 April 1958 are presented to illustrate quantitatively the important effect of warm cloud radiation on surface air temperature and its vertical gradient. *Subject Headings:* **1. Annual temperature range 2. Polar temperatures 3. Stratospheric temperature variations 4. Antarctic temperature variations 5. "Kernlose" winter 6. Antarctica I. Bonacina, L. C. W.**—*Author's abstract.*

11.8–230 551.524.73:519.241.6

Bagrov, N. A. and Kukhto, A. P., **Izmenchivost' srednikh mesiachnykh temperatur i vysot AT_{500}.** [Variability of mean monthly temperatures and 500 mb heights.] *Sbornik Rabot po Sinoptike,* Moscow, No. 3:139–151, **1959.** 9 figs., table, 3 refs. **DWB**—The variability of mean monthly values of temperatures is considered to be the scattering of values of temperature of individual months relative to mean long period values. As a measure of variability of mean monthly temperatures the authors selected the standard deviation, σ, which in this study is determined by the formula $\sigma = 1/a_n A_n$, where A_n = amplitude determined for a series, n = years of observations and a_n = corresponding coefficient depending upon years of observations. By means of this formula the variability of the mean monthly temperatures of European U.S.S.R. and the Caucasus, Western Siberia and Central Asia, and Eastern Siberia and Primor'e (presented in tables) and the variability of 500 mb surfaces were investigated. Maps of the distribution of σ for each month at the 500 mb level were constructed and the mean values of the standard deviations of adjacent months beginning with January and February were combined so that 6 maps with variability of AT_{500} are presented and analyzed. It was found that the smoothness of the annual variations of the variability of the height of AT_{500} may be destroyed without visible cause. The variability during the winter exceeds considerably that during the summer when in most cases the variability attains a minimum. The variability of AT_{500} like that of the mean monthly surface temperature has a distinct annual variation but lacks a smooth variation. The cause of this is most likely inadequate data. In contrast to the variability of surface temperatures where oceanic influence diminishes the variability of the temperature regime, the maps of AT_{500} variability show a much greater variability during the entire year over oceans in comparison to variability over continents. The value of σ at AT_{500} increases with latitude with the exception of regions over the Pacific and Atlantic Oceans. *Subject Headings:* **1. Monthly mean temperature data 2. Monthly mean upper air charts 3. Temperature variability 4. Upper air pressure variations.**—*I.L.D.*

11.8–231 551.524.73

Loewe, Fritz, **Zur troposphärisch-stratosphärischen Kompensation in den höheren Breiten der Südhalbkugel.** [Tropospheric-stratospheric compensation in higher latitudes of the Southern Hemisphere.] *Beiträge zur Physik der Atmosphäre,* Frankfurt a.M., 31(1/2): 109–130, **1958.** 5 figs., 10 tables, 19 refs. German, English and French summaries, p. 109–110. **DWB, DLC**—The relationship between the simultaneous changes in temperature in the troposphere and stratosphere in the southern hemisphere, and the role of convection and advection in the temperature relationship are investigated. From 10,000 radiosonde flights in latitude 35°S to 78°S the mean heights of standard isobaric surfaces and thicknesses (mean temperature) of tropospheric (400–900 mb) and stratospheric layers (100–200 mb) were determined. Many features of the free atmosphere at Heard Island and the Falkland Islands show a closer approach to polar conditions than at Macquarie Island notwithstanding the

higher latitude of the latter. The stratospheric temperatures vary everywhere as much as those of the troposphere. The simultaneous temperatures in troposphere and stratosphere vary mostly in the opposite sense; the tropospheric-stratospheric "compensation" in the southern hemisphere is well developed. This applies to the deviations of the daily temperatures from the monthly mean, the interdiurnal temperature variations and the deviations of the individual mean monthly temperatures from the overall mean for the month. In late winter the compensation becomes less strong south of 50°S. This is due mainly to the coupling of a very cold troposphere with a cold stratosphere which is probably caused by high reaching advection from Antarctic latitudes. Near the Antarctic Circle the significant compensation is restricted to the summer; it disappears completely in the highest Antarctic latitudes. The height of the tropopause in subantarctic latitudes is throughout the year positively correlated with the mean temperature of the troposphere and negatively with that of the lower stratosphere. At the Antarctic coast the correlation between the tropopause height and the temperatures is still significantly present for the whole year, but is not found in all months. *Subject Headings:* **1. Temperature in Southern Hemisphere 2. Tropospheric-stratospheric temperature compensation 3. Southern Hemisphere.**—*Author's summary and I.L.D.*

SOIL TEMPERATURE

See also: **Temperature fluctuations over heated surface** (Townsend), 11.8–239.

11.8–232 551.525.4:553.623

Andó, M. (*Climatological Inst., Szeged Univ.*), **Beitrag zur Bodentemperatur des Flugsandes.** [Contribution to the soil temperature of shifting sand.] *Acta Geographica*, Szeged, Hungary, n.s. 1(1/4):3–7, **1955.** 2 figs., 3 tables, 6 refs. **DLC** –The author investigated the temperature distribution at four levels (2, 5, 10 and 20 cm) within the shifting sands situated between the Danube and Tisza Rivers. The study was carried out during June 13–23, 1954. The sizes of the sand grains were measured at each level and the size composition of the drifting sand at the different levels is given in a table. On dry, warm days the diurnal radiation produced an intense warming of the sand which manifested itself through large amplitudes to depths of 10 cm. At 20 cm the temperature levelled off. At the different levels the maximum was retarded by one hour. Soil temperature amplitudes were: at 2 cm 20.2°C, at 5 cm 17.0°C, at 10 cm 13.2°C, and at 20 cm 3°C on June 14. The soil temperature gradient of 2 5 and 5–10 cm layers amounted to 0°C during the minimum of the 10 cm sand layer at 7 and 8 o'clock succeeding dry, cloudless warm days concluded with a gain in heat; this was expressed in the rise of the temperature minimum. Precipitation cooled the sand rapidly. The variation of temperature is illustrated by means of tables of maximum and minimum at the various depths and by means of graphs. *Subject Headings:* **1. Soil temperatures in shifting sand 2. Hungary.**—*I.L.D.*

11.8–233 551.525.4:551.579.5:536.24

Deriabin, V. P., **Teploperedacha vo vlazhnoĭ dispersnoĭ srede.** [Heat transfer in a moist disperse medium.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofizich.*, No. 5:739–743, **1959.** 4 figs., table, 8 refs., 8 eqs. **DWB, DLC**—The author attempts to give a quantitative dependence of the heat conductivity of granular soils upon humidity and porosity. In deriving the formulae of heat conductivity of granular soils the following assumptions are made for the sake of a simplified solution, viz: the soil is represented by a model of an aggregate of contiguous spheres of uniform radius R; for a given aggregation of spheres the direction from the center of any sphere at the point of contact with adjacent spheres forms similar angles equal to a with a direction l of the total heat flux; and the fundamental cause of variation of porosity is regarded as the partial variation of the aggregate from the most dense (hexagonal with porosity of 26%) to the least dense (cubic with porosity of 46%). An expression for the heat conductivity of moist soil is derived, namely

$$\lambda = \frac{\lambda_1^* \lambda_2^* (p_1 - p_2)}{p(\lambda_2^* - \lambda_1^*) + p_1 \lambda_1^* - p_2 \lambda_2^*}$$

where λ_1^* and λ_2^* are heat conductivities of aggregates with porosities p_1 and p_2. By inserting the values of λ_1^* and λ_2^* in this formula it is found that the heat conductivity of a disperse medium consisting of a mixture of two aggregates is equal to $\lambda = (17\pi\lambda_1/p - 13.8)\Phi(\mu)$ where μ is associated with soil humidity. The value of μ is determined from $\mu = \frac{1}{2} + \cos(\pi + \phi/3)$ where $\phi = \text{arc cos}(1-2E)$. Graphs showing the dependence of μ upon humidity and porosity and of the function $\phi(w,p)$ are presented. A table giving the results of calculations indicates the agreement of theoretical with experimental data. *Subject Headings:* **1. Soil heat conductivity 2. Soil moisture effects on heat conductivity.**—*I.L.D.*

11.8–234 551.525.4:551.579.5:631.43

Gorbunova, I. G.; D'iachkova, T. V. and Serova, N. V., **Nekotorye rezul'taty izmereniia teplofizicheskikh kharakteristik pochvy v estestvennykh usloviiakh.** [Some results of measurements of the thermophysical characteristics of soil under natural conditions.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy,* 77:79–83, **1958.** 4 figs., 2 tables, 12 refs., eqs. **DWB, DLC**—The author attempts to determine the thermophysical properties of soil under natural conditions and to investigate the dependence of these characteristics upon soil density and humidity. Observations were carried out at the agrometeorological station of Koltushi on finegrained sand and at the Voeĭkov meteorological station on fine clay sand. The apparatus consisted of a frame 110×200 mm with stretched fine wires with which it is possible to measure the natural structure of the soil with a minimum of disturbance. The measurement procedure is described and the results are presented in tables and graphs. The heat conductivity of sandy soil at $\rho_{sp} = 1.2 - 1.4$ g/cm³ within the limits of variation of W (moisture) from 18 to 28% increases slightly from 2×10^{-3} to 2.5×10^{-3} cal/cm sec degree. At $\rho_{sp} = 0.8$ g/cm³ (which corresponds to a density of the cultivated layer) λ (heat conductivity) varied from 1.0×10^{-3} to 1.2×10^{3} cal/cm sec degree. The heat conductivity of sandy soil within the same limits of moisture variation practically did not vary at all. For light clay soil ($\rho_{sp} = 1.3$) heat conductivity with increased humidity from 14 to 20% increased from 1.2×10^{-3} to 1.5 to 10^{-3} cal/cm sec degree. The temperature conductivity within the same limits of moisture change fell sharply from 3×10^{-3} to 2.5×10^{-3} cm²/sec. The heat conductivity of moist sandy soil ($W = 20$–24%) increased sharply with increase in density. Change of ρ_{sp} from 0.8 to 1.3 g/cm³ produced a change of λ from 0.9×10^{-3} to 2.5×10^{-3} cal/cm sec degree. The temperature conductivity of moist soil during the change of ρ_{sp} within the same limits increased slightly: from 3.3×10^{-3} to 4.1×10^{-3} cm²/sec degree, etc. *Subject Headings:* **1. Soil temperature data 2. Soil heat conductivity.**—*I.L.D.*

WATER TEMPERATURE

See also: **Stratus cloud and sea temperature, Pembroke Dock** (Krill), 11.8–265; **Paleotemperatures and abyssal fauna** (Birstein), 11.8–302.

11.8–235 551.526.6:519.241.6

Schell, Irving I. (*Woods Hole Oceanog. Inst.*), **On a criterion of representativeness of sea-surface temperature data.** *American Meteorological Society, Bulletin,* 40(11):571–574, Nov. **1959.** 2 tables, 9 refs. **DWB, DLC**—Three pairs of historical series of mean monthly sea-surface temperatures in the North Atlantic were analyzed, one pair from the tropical area, 15N to 20N, 60W to 65W, dominated by the North Equatorial Current; the second from the semitropical area, 30N to 35N, 55W to 60W, by the Gulf Stream; and the third pair from the polar area, 45N to 50N, 45W to 50W, off Newfoundland by the Labrador Current. The results obtained show that, by successively eliminating those values based upon few observations per month, the standard deviation, σ, tends to become relatively constant and may then serve as a criterion of the representativeness of sea surface temperature data. *Subject Heading:* **1. Sea surface temperature data.**—*Author's abstract.*

11.8–236 551.526.8(285:774)

Ahrens, Robert J. (*U. S. W. B., Milwaukee, Wisc.*), **Lake Michigan water temperatures.** *Mariners Weather Log,* Wash., D. C., 3(3):77–78, May **1959.** fig. **DWB**—The graph of mid-lake average and extreme water temperatures in comparison with the Milwaukee air

temperature for each month 1941–1954 shows some interesting relations explained briefly. The 20°F lag between average water and air temperatures in the spring is due to the maximum density of water at 39.2°F which the entire water body must attain prior to any effective surface warming. A true surface temperature of 72–74°F is indicated by 70–75°F as reported from beaches late July and August. *Subject Headings:* **1. Lake temperatures 2. Lake Michigan, United States.**—*W.N.*

PRESSURE AND WIND

PRESSURE

See also: **Changes in pressure field of middle troposphere** (Obukhov, Chaplygina), 11.8–162; **Prognostic applications of empirical influence functions** (Belov), 11.8–163; **Forecasting pressure field in middle troposphere** (Kogan), 11.8–165; **Upper-air pressure associated with basic synoptic processes** (Khazova), 11.8–166; **Interlatitudinal exchange of air masses in stratosphere** (Zubian), 11.8–185; **Wind divergence, vorticity and pressure change** (Mertsalov), 11.8–206; **Variability of temperature and 500 mb height** (Bagrov, Kukhto), 11.8–230.

11.8–237 551.543.3(213)

Rudloff, Willy (*Hamburg*), **Bemerkenswerte Luftdruckschwankungen in den Tropen.** [Remarkable pressure variations in the tropics.] *Annalen der Meteorologie*, Hamburg, 8(11/12):363–372, **1959.** 7 figs., 3 tables, 7 refs. English summary p. 372. **DWB, DLC**—Inside the tropics the local pressure was oscillating with a mean period of 5 days. These oscillations were moving from east to west and often passed around the globe in 5 days. It is supposed that these pressure waves are of ionospheric origin. Pressure oscillations with periods of several days happened to be more or less parallel in the Pacific and Asiatic quadrant and especially in the African and American quadrant. The mean tropical pressure, averaged over the quadrants, was positively correlated with the zonal circulation of the Atlantic-European region. *Subject Headings:* **1. Pressure oscillations 2. Tropical regions.**—*Author's summary.*

TURBULENCE

See also: **Scintillation of stars** (Elsässer), 11.8–55; **Smoke diffusion from stacks** (Gandin, Solovei̇chik), 11.8–192; **Atmospheric diffusion** (Monin), 11.8–193.

11.8–238 551.551:551.511.6

Saïssac, Joseph, **Sur la diffusion atmosphérique à grande échelle.** [Large scale atmospheric diffusion.] *Académie des Sciences, Paris, Comptes Rendus*, 248(14):2114–2116, April 6, **1959.** 1 fig., 3 refs. **DWB, DLC**—Observation and study of diffusion at a certain level above the ground, under conditions of homogeneous and anisotropic turbulence, with respect to the Eulerian data of wind. Statement of the observation method and of the results which, on the whole, invalidate the universality of autocorrelation with time, originally adopted by G. I. Taylor for turbulent motion. The results reveal the existence of lasting privileged periods in the natural turbulence, and hence, show the interest of studying the large time-scale autocorrelations. *Subject Headings:* **1. Atmospheric diffusion 2. Turbulent diffusion 3. Eulerian wind 4. Magny-les-Hameaux, France.**—*A.V.*

11.8–239 551.551.2:551.524.2:551.525.2

†Townsend, A. A., **Temperature fluctuations over a heated horizontal surface.** *Journal of Fluid Mechanics*, N. Y., 5(2):209–241, Feb. **1959.** 24 figs., 4 tables, 21 refs., 10 eqs. **DWB**—Experiments designed for a detailed study of temperature fluctuations in a system of natural convection which approximates the ideal one, are reported. The paper includes description of experimental arrangements, the use of a resistance thermometer to measure temperature fluctuations, mean temperatures, intensities, gradients, differential changes, statistical distributions of various characteristics, the physical description of the flow, production and destruction of temperature fluctuations, and an appendix on the relation that exists between

the rate of change of temperature and temperature gradient in turbulent flow. *Subject Headings:* **1. Temperature fluctuations 2. Temperature over heated surfaces 3. Turbulent transfer of heat.**—*N.N.*

11.8–240 551.551.5

†Balzer, M. E. and Harrison, H. T., **The nature of high level clear air turbulence.** *United Air Lines, Denver, Colorado, UAL Meteorology Circular*, No. 48, July 1, **1959.** 17+29 p. 6 figs., tables, 3 refs. Appendix 2, Annotated bibliography, 42 titles. **DWB**—Two U. S. maps illustrating the geographical distribution of clear air turbulence in 927 specific areas, 87 cases of which have been most severe, are given. The report includes a synopsis on the different types of clear air turbulence (CAT) and the associated effects of wind velocities, temperature, tropopause and terrain. The forecasting methods of CAT is as involved and complex as that of the thunderstorm. The report indicates that the methods of its forecast will be covered in UAL Meteorological Circular No. 49. The means whereby turbulence effects can be minimized are given. *Subject Headings:* **1. Clear air turbulence 2. High level turbulence.** —*N.N.*

11.8–241 551.551.5:061.3

Meteorological Office Discussion on Clear-air turbulence. *Meteorological Magazine*, London, 88(1040):50–54, Feb. **1959.** 8 refs. **DWB, DLC** —Some of the characteristics of clear air turbulence discussed appear to indicate that topography and wave motions (set off by mountains) may provide a mechanism for strong shear. Shears can be horizontal as well as vertical. Turbulence in patches from 1–100 miles across have been encountered. Turbulence is more frequent over rugged mountainous surfaces than over smooth surfaces (sea), and has been encountered from 20,000–55,000 f.a.s. with maximum frequency at 30,000 f.a.s., likewise within and close to jet streams. It was also suggested that mackerel cloud regions are turbulent and that fluids do not flow in a straight line unless made to do so. More information on meteorological causes and associations is needed. Instrumentation for observing clear-air turbulence involves accelometers and drop gust sondes and the new and promising radio theodolite. Encountering turbulence is compared with riding a car on a cobblestoned surface, at times also felt like something hitting the aircraft. Aircraft designers worry about the possible resonance effect from turbulence of regular periodicity on the modern airships. *Subject Heading:* **1. Clear air turbulence.**—*W.N.*

WIND DISTRIBUTION AND VARIATIONS

See also: **Probability of hurricane-force winds** (Kimball), 11.8–135.

11.8–242 551.553.21

Emsalem, René, **Sur la mousson d'après un ouvrage récent.** [The monsoon, according to a recent work.] *Revue de Géographie de Lyon*, Lyons, 34(2):163–168, Feb. **1959.** 6 refs. **DWB**—This memorandum begins with a short summary of the work headed **"Les Moussons"** (The Monsoons) by P. Pedelaborde (*see* 10.2–8, Feb. 1959, *Met. Abstr.*). Author mentions that the monsoon does not result only from a system of winds turning back from winter to summer, and points out the existence of thermal and stratospheric monsoons. Examination of the general atmospheric circulation over Asia according to the representation of R. Scherhag and that of Y. Mintz and G. Dean. *Subject Headings:* **1. Monsoon circulation 2. General circulation 3. Asia.**—*A.V.*

11.8–243 551.553.21:551.577.32(94)

Treloar, H. M. (*Dept. Meteor. Melbourne Univ.*), **The north west monsoon and seasonal rainfall in Northern Australia.** *Pan Indian Ocean Science Congress, Aug. 1954, Perth, Western Australia, Proceedings of Section A, Physical Sciences*, (pub. **1958?**). p. 32–38. 7 tables, 13 refs. **DWB** (506.35 P187pr)—Different methods of forecasting summer rains in Northern Australia have been used to determine the synoptic relations that exist between the North West Monsoons and seasonal rainfall in the area. A statistical examination of the weather situations, cyclones and pressure intensities has been made and is discussed in this paper.

Brisbane pressure is the indicator of the position of Southern anticyclones in the region where the flow from them might affect the territory. *Subject Headings:* **1. Monsoon rainfall forecasting 2. Seasonal rainfall forecasting 3. Northern Australia.**—*N.N.*

11.8–244 551.553.8:550.342

Iyer, H. M.; Lambeth, D. and Hinde, B. J. (*all, Nat. Inst. of Oceanography, Wormley, nr. Godalming, Surrey*), **Refraction of microseisms.** *Nature*, London, 181 (4609):646–647, March **1958.** 2 figs., 3 refs. **DWB**—For microseisms generated by storms in the deep ocean the amount of refraction depends upon the actual position of the storm with respect to the recording station; hence the parallel wave-front theory cannot be applied. The author constructed new refraction diagrams by using the reciprocity principle. Rayleigh waves are supposed to originate from the recording station and then travel inward. The initially circular wave fronts become distorted as the wave progresses through the Atlantic Ocean bed. From these wave fronts rays are drawn at $2\frac{1}{2}°$ intervals. Refraction diagram constructed for 6 and 9 sec periods is presented. The 9-sec microseisms are refracted less than those of the 6-sec period. Various focusing and diverging effects are discussed. *Subject Heading:* **1. Microseismic refraction.**—*I.L.D.*

11.8–245 551.553.8(410,416):519.24

Shellard, H. C., **Extreme wind speeds over Great Britain and Northern Ireland.** *Meteorological Magazine*, London, 87(1035):257–265, Sept. **1958.** 3 figs., 3 tables, 8 refs. **DWB, DLC**—In determining maximum wind velocities for design purposes the actual requirement involves an estimate of the probability of occurrence of extreme values based not only on one extreme value but on all the values available. The application of extreme probability theory, as developed by E. J. Gumbel, to annual extreme wind speeds is illustrated. The wind data from 49 anemograph stations were analyzed. Data are presented in tables on the annual maximum wind speeds (gusts) at Cardington (1932–1954), maximum mean hourly wind speeds in miles per hour at 33 ft above the ground for 49 anemograph stations in Great Britain and Northern Ireland, and maximum gust speeds, in m.p.h., at 33 ft above the ground; also maps showing isolines of highest mean hourly wind speeds (m.p.h.) at 33 ft above the ground likely to be encountered once in 50 years, and highest gust speeds (m.p.h.) at 33 ft, likely to be encountered once in 50 years, are presented. (For abstract on this from another source, *see* 8.8–250, Aug. 1957, *Met. Abstr.*) *Subject Headings:* **1. Wind speed maximum 2. Extreme winds 3. Great Britain 4. Northern Ireland.**—*I.L.D.*

11.8–246 551.553.8:551.515.1/2(52)

Svinukhov, G. V., **Razrushitel'nyĭ uragannyĭ veter na Severnykh Kurilakh.** [Destructive storm in the northern Kurile Islands.] *Meteorologiia i Gidrologiia*, Leningrad, 9:36–37, Sept. **1958. DWB, DLC**—On Dec. 14, 1957 a storm occurred in the Northern Kuriles; it caused extensive destruction in various cities and villages. This storm was produced by a cyclone which lay over the Sea of Okhotsk. The cyclone developed on Dec. 12 over northeast China on a polar front. The pressure in its center was somewhat less than 1015 mb; then it deepened and rapidly moved northeast. The maximum velocity of movement was observed on Dec. 13 when its speed was 100 km/hr. At 11:00 o'clock on Dec. 14 the center of the cyclone was south of Paramushir Island; the pressure at its center was 960 mb. The radius of the cyclone was 1300 km and the pressure gradient was 10 mb per degree of longitude. The destructive storm began after 14:00 o'clock when the wind shifted to the southerly quadrant. Wind gusts of 60 m/sec were recorded. In the straits the height of the waves reached 5–6 meters. *Subject Headings:* **1. Destructive winds 2. Cyclonic storms 3. Kurile Islands.**—*I.L.D.*

WIND EFFECTS

See also: **Microseisms, Issyk-Kul' Lake** (Savarenskiĭ et al.), **11.8–120.**

11.8–247 551.556.2:533.6.07

Tani, Nobuteru, **On the wind tunnel test of the model shelter-hedge.** *Tokyo. National Institute of Agricultural Sciences, Bulletin, Ser. A*, No. 6:1–80, March **1958.** 45 figs., 18 tables,

81 refs., eqs. In Japanese; legends in English. English summary p. 75–80. **DWB** –The author discusses windbreak effects of hedges as shown by model experiments of atmospheric phenomena, stressing the importance of the difference that exists between atmospheric wind and the wind tunnel flow. An illustration of the similarity that the two flows have is made mathematically. There is empirically no difference in the resistance coefficients because they depend, in the main, on the width of the hedge. The conclusion is reached that a hedge of excessive density makes the effect zone rather narrow, and that the most suitable density of the hedge could be estimated experimentally as between 70 to 80 percent. Reasons for this percentage are given in the report. *Subject Headings:* **1. Windbreak effectiveness 2. Wind tunnel experiments.**—*N.N.*

UPPER AIR WINDS

See also: **Rabal system for high-altitude wind data** (Miller), 11.8–153.

11.8–248 551.557.36:551.508.57(729.9)

Jordan, C. L. (*Florida State Univ.*), **An instance of reported winds of 200 knots in the lower troposphere.** *American Meteorological Society, Bulletin*, 40(8):410-415, Aug. **1959.** 3 figs., table, 11 ref. **DWB, DLC**—Rawin observations made at Kindley AFB, Bermuda on 28 March 1955 reported unusually strong winds in the lower troposphere at two successive observation times. A maximum reported speed of 222 kn was shown at 9000 ft at the top of a strong frontal inversion. The credibility of these observations is examined along with aspects of the general problem of evaluating cases of extremely strong rawin reports. *Subject Headings:* **1. Extreme wind speeds aloft 2. Rawinsonde data 3. Bermuda.**—*Author's abstract.*

11.8–249 551.557.5:551.510.528

Brundidge, K. C., **A preliminary study of eleven Project Jet Stream flights, 1956–57 phase.** (In: Saucier, W. J., et al., **Wind field near the tropopause.** Texas. A. & M. College. Dept. of Oceanography & Meteorology, Contract AF 19(604)-1565, Final Report, Dec. **1958.** p. 86–108. 16 figs., 7 refs., 2 eqs.) **DWB** –The eastern United States has two general types of jet streams, namely, those with steep fronts and strong baroclinity and those that are associated with relatively flat fronts and occasionally minor upper-tropospheric stable layers. *Subject Headings:* **1. Tropopause wind field 2. Project Jet Stream.**—*N.N.*

11.8–250 551.557.5:629.135

Endlich, Roy M. and McLean, G. S. (*both, U. S. Air Force Cambridge Research Center*), **Lore of the jet stream core.** Reprint, p. 10–13, from *Combat Crew*, May **1957.** 5 figs., port. **DWB** (M57.2 E56Lo) –Instrumented aircrafts such as the B-47 and the B-29 are shown to be very accurate tools for meteorological research (jet streams, mountain wave and hurricanes). This is a report of the Project Jet Stream as conducted during the winters 1953/54 and 1954/55. The average conditions of wind, temperature, turbulence, clouds and contrails near the jet stream are determined and presented. The term "Jet stream front" or rather "Jet front" is introduced for the downward sloping southward layer from the core of the jet stream. Only light turbulence was encountered, but at two regions it was encountered more than 30% of the time. The flight technique described includes Capt. CHARLES HAWKIN'S expressed belief that "use of the temperature indications alone would make it possible to position an aircraft without wind measuring equipment within the 85% isotach." *Subject Headings:* **1. Jet stream data 2. Project Jet Stream.**—*W.N.*

11.8–251 551.557.5:551.510.528

Saucier, W. J. et al, **Wind field near the tropopause.** Texas. Agricultural and Mechanical College. Dept. of Oceanography and Meteorology, Contract AF 19(604)-1565, Final Report, Dec. **1958.** 140 p. figs., tables, refs., eqs. **DWB**—This final report contains background information on Project Jet Stream (1953–1957) and 6 other articles (abstracted separately). It affords the reader a good opportunity of understanding the wind distributions in the jet streams of the southeast United States, the clear air turbulence and bumpiness, its duration as well as the operations of the eleven Project Jet Stream flights that were undertaken in 1956–57. The volume includes some new models of the jet streams. A further study of jet stream

turbulence and adequate suggestions for future research in the field are enumerated. *Subject Headings:* **1. Tropopause wind field 2. Project Jet Stream.**—*N.N.*

VERTICAL MOTION

See also: **Statistical study of convective currents** (Vul'fson), 11.8–184; **Calculation of convective currents** (Vasil'chenko), 11.8–194; **Hot weather as cold-producing mechanism** (Hollmann), 11.8–195.

11.8–252 551.558.1:551.511:693.1

Dobryshman, E. M., **Nestatsionarnaia zadacha o konvektsii u vertikal'noĭ stenki.** [Nonstationary aspects of convection along a vertical wall.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 43(70):57–63, **1956.** fig., 4 refs., 18 eqs. **DWB, DLC**—The equations for convection along a vertical wall are transformed by the introduction of dimensionless variables into the following form:

$$\frac{\partial y^2}{\partial^2 u}+\theta=\frac{\partial u}{\partial t}+u\frac{\partial u}{\partial x}-\frac{\partial u}{\partial y}\int_0^y\frac{\partial u}{\partial x}\,dy$$

$$\frac{1}{Pr}\frac{\partial^2\theta}{\partial y^2}=\frac{\partial\theta}{\partial t}+u\frac{\partial\theta}{\partial x}-\frac{\partial\theta}{\partial y}\int^y\frac{\partial u}{\partial x}\,dy.$$

The boundary conditions are:

$$y=0,\qquad u=v=0,\qquad \theta=f(t),\qquad y=\infty,\qquad u=\theta=0.$$

Equations for the precise and approximate solution for θ and u are presented. With the aid of the equations whose solution has been obtained theoretical analyses are made for the development of convection and for a variable convection regime. *Subject Headings:* **1. Convection along a vertical wall 2. Convection equations.**—*I.L.D.*

11.8–253 551.558.1:551.515.3

†Lacaze, J., **Tourbillons atmosphériques d'axes verticaux. (Tourbillons de sable).** [Vertical atmospheric vortices. (Sand whirls).] *Journal Scientifique de la Météorologie*, Paris, 10(40):133–147, Oct./Dec. **1958.** 7 figs., 29 refs. French, English and Spanish summaries p. 133. **DWB**—Morphology and structure of whirlwinds observed in the Sahara are described in detail, as well as the conditions in which they start and move. Description is given of the general exterior aspect, the accompanying general phenomena and the conditions of existence of different kinds of eddies with vertical axes. Among the sand trails and their transformation are mentioned: sand trails on a flat ground of uniform color, sand whirls on a flat ground of uniform color, sand whirls on a flat ground with contrasting colors, sand whirls on a hilly ground of uniform color and sand whirls on a hilly ground with contrasting colors. It is suggested that laboratory experiments be undertaken, lacking of measurements on the spot. A comparison is made with other types of eddies in meteorology. Finally, are indicated the outlines of a theory to be explained in the second part. *Subject Headings:* **1. Vortex structure 2. Whirlwinds 3. Thermals 4. Waterspouts.** —*A.V. and author's abstract.*

11.8–254 551.558.2:551.576.1

†Kuettner, Joachim (*GRD, AF Cambridge Res. Center*), **The band structure of the atmosphere.** *Tellus*, Stockholm, 11(3):267–294, Aug. **1959.** 33 figs., 63 refs. **DLC**—A study of the band structure of cloud systems to be published in two parts, of which Part I appears here. Part II, to be published separately, will discuss the theory of organized convection in the atmosphere. The present section is devoted to a general description of the phenomenon and the results of a special aerological investigation. A wide variety of observational material is presented to indicate the conditions under which bands form in the atmosphere. The observations suggest that most cloud bands line up in the flow direction and originate in convective layers. A preliminary note on the mechanism thought to be operative in the convection bands is also included. The paper is extensively illustrated by photographs featuring different types of band formations. *Subject Headings:* **1. Convective cloud structure 2. Cloud bands.**—*I.S.*

AQUEOUS VAPOR, HYDROMETEORS AND HYDROLOGY

HUMIDITY

See: **Moisture exchange, forest zone of European U.S.S.R.** (Bashtan), 11.8-41; **Relation between precipitation, radiation, evaporation and humidity** (Evseev), 11.8-213; **Temperature and humidity gradients near the ground** (Rákóczi), 11.8–227; **Calculator for temperature-humidity computation** (Killen, Evenson), 11.8–228; **Atmospheric humidity near Algyő** (Andó), 11.8–307.

EVAPORATION AND EVAPOTRANSPIRATION

See also: **Moisture exchange, forest zone of European U.S.S.R.** (Bashtan), 11.8-41; **Thermal and water balance of pine forest** (Rauner), 11.8–212; **Relation between precipitation, radiation, evaporation and humidity** (Evseev), 11.8–213; **Precipitation, evapotranspiration and aridity, W. Pakistan** (Ahmad), 11.8–266.

11.8–255 551.573:581.11(512.317)

*Ramage, C. S., **Evapotranspiration in Hong Kong: a second report.** *Pacific Science*, Honolulu, 13(1):81–87, Jan. **1959.** 5 figs., 3 tables, 7 refs. **DWB** (M(055) H389sc), **DLC** — (For First Report *see* 6.5–209, May 1955, *Met. Abstr.*) Five years of potential evapotranspiration measurements (1951–1956) at King's Park, Hong Kong (22°19′N, 114°10′E, elev. 213 ft) are analyzed in connection with rainfall, mean temperature, dew point, sunshine and wind data for Royal Observatory, Hong Kong and the data used to compare the effectiveness of Thornthwaite's, Penman's and the author's simple empirical formula. It is concluded that Penman's formula is more applicable to Hong Kong conditions than Thornthwaite's but both of these give values which are too low in winter and too high in summer. The new formula which follows the simple linear expression $PE=\sqrt{E_a}+\sqrt{e_a}-3.5$ mm/day is shown to be in much closer agreement with observed data than is either of the other two formulas. Evapotranspiration formulas based on mid-latitude data should be critically examined before use in monsoon or tropical regions. (This abstract is a revision of 10J–150, Oct. 1959, *Met. Abstracts.*) *Subject Headings:* **1. Evapotranspiration 2. Hong Kong.**—*M.R.*

CONDENSATION

See also: **Silver iodide nuclei in rainwater** (Gübeli), 11.8–275; **Non-molecular scattering in high atmosphere** (Morozov), 11.8–323.

11.8–256 551.574.1/2:551.521.17

Barnard, A. J. and Mouton, W. L. (*both, Physics Dep., Univ. of Natal, So. Africa*), **Condensation produced by ultra-violet light.** *Nature*, London, 182(4641):1001–1002, Oct. 11, **1958.** fig., 6 refs. **DWB**—The object of the study discussed here was to establish the origin of condensation nuclei. Experiments were first made with several mixtures in a conventional rubber-diaphragm cloud chamber suggesting that the nuclei arose from a contaminated chamber material and not from the gas-mixture per se. Subsequent checking involved construction of a chamber eliminating this possibility, and distilled water was used as a condensant, room air as the permanent gas (purified). It is concluded that the bulk of the nuclei observed with water vapor is subject to contamination. The work goes on. *Subject Headings:* **1. Condensation nuclei formation 2. Cloud chamber experiments.**—*W.N.*

11.8–257 551.574.11:551.510.42

Day, G. A. (*Commonwealth Scientific and Industrial Research Organization, Radiophysics Lab., Sydney, Australia*), **Sublimation nuclei.** *Physical Society of London, Proceedings*, 72:296–299, **1958.** 2 figs., 2 refs. **DLC**—Mossop (1956) states that on warming ice crystals formed on iceland spar from −41°C, the threshold temperature for the spontaneous nucleation of supercooled water drops, between 1 and 5% of the particles acted as sublimation nuclei until a temperature of −3.7°C was reached. This limiting temperature is much warmer than that at which iceland spar operates as a normal freezing nucleus and higher than that at which any known substance is capable of promoting ice formation. In view of the importance of this

phenomenon, a series of experiments was made to determine whether these "sublimation nuclei" particles would retain this singular property after prolonged drying and then be capable of regrowing ice crystals at these warm temperatures. The experiment was carried out in a freezing chamber with a section for placing the ice crystals under lower relative humidity. A diagram of the equipment is given. It is concluded that the iceland spar can indeed retain its nucleating properties for a greater time than the naturally occurring particles in the atmosphere and the other substances tested but these results suggest that retention of any film of ice on the surface is limited to rather special circumstances and that after exposure for several minutes to humidities around 80–90%, the evaporation appears complete. *Subject Headings:* **1. Iceland spar nuclei 2. Sublimation nuclei 3. Nuclei effectiveness.**—*A.J.M.*

11.8–258 551.574.11:551.510.42:551.21(52)

Isono, K.; Komabayasi, M. and Ono, A. (*all, Geophys. Inst., Univ. Tokyo*), **Volcanoes as a source of atmospheric ice nuclei.** *Nature*, London, 183(4657):317–318, Jan. 31, **1959.** 2 figs., 4 refs. **DLC**—Ice nuclei concentrations have been measured in Tokyo at temperatures of −13°C, −15°C and −20°C in order to determine the nature and the concentration of ice-forming nuclei in the atmosphere. These play an important part in the initiation of rain. The results of this investigation show that the concentration of such nuclei is low in maritime air masses and high in the air masses which reach Japan from arid or semi-arid regions of the continent of Asia. *Subject Headings:* **1. Volcanic nuclei 2. Nuclei and air masses 3. Japan.** —*N.N.*

FOG

See also: **Fog and smoke at Orly Airport** (Duvergé), 11.8–30; **Fog at Madrid airport** (Medina e Isabel), 11.8–31; **Water yield from rain and fog, Bavarian Forest** (Baumgartner), 11.8–309.

11.8–259 551.575.1:551.578.46

Kliuchnikova, L. A., **Advektivnye tumany okhlazhdeniia nad poverkhnost'iu snezhnogo pokrova.** [Advection cooling fogs over a snow cover.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, 77:3–6, **1958.** 16 eqs. **DWB, DLC**—The author examines the conditions under which advective cooling fogs can be formed over a snow cover. Such fogs are observed on the coasts of northern seas where the snow covers are established earlier than the freezing of water in the water body and in the central Arctic where open waters are observed during the entire winter half of the year. The interaction of a moving air mass with an underlying surface is accomplished primarily by turbulent mixing. For a stationary problem in the case of horizontal homogeneity of an air mass and absence of vertical currents the problem is reduced to the solution of the equations of turbulent diffusion for temperature and absolute humidity

$$u\frac{\partial T}{\partial x}=\frac{\partial}{\partial z}k(z)\frac{\partial T}{\partial z},\qquad u\frac{\partial q}{\partial x}=\frac{\partial}{\partial z}k(z)\frac{\partial q}{\partial z}$$

for the following limiting conditions:

$$T(x,z)\big|_{z=0}=T^0(z),\qquad T(x,z)\big|_{z=0}=q^0(z),$$
$$T(x,z)\big|_{z=\infty}=T^0(\ldots),\qquad q(x,z)\big|_{z=\infty}=q'(\ldots).$$

The derivations of formulas for computing equivalent temperature transformation of an air mass and for determining the approximate value of the absolute humidity are presented, namely:

$$\theta(\xi,\zeta)=\theta_{0\ \mathrm{air}}+\theta_1\left[\frac{\zeta}{2(1-2n)}\right]^{2n}+(\theta_{0\ \mathrm{snow}}-\theta_{0\ \mathrm{air}})P\left(\frac{\zeta^2}{2\xi},2n\right),$$

where $P\left(\frac{\zeta^2}{2\xi},2n\right)$ is a probability function of $\frac{\zeta^2}{2\xi}$, and

$$q=(\xi,\zeta)=q_{0\ \mathrm{air}}+q_1\left[\frac{\zeta}{2(1-2n)}\right]^{2n}+(q_{0\ \mathrm{snow}}-q_{0\ \mathrm{air}})P\left(\frac{\zeta^2}{2\xi}2n\right)$$

respectively. A nomogram for comparing with these equations is presented. *Subject Headings:* **1. Advection fog over snow 2. Snow cover effects on fog.**—*I.L.D.*

11.8–260 551.575.5(26)

Rodewald, Martin, **Beobachtung von Seerauch.** [Observation of sea smoke.] *Wetterlotse*, Hamburg, No. 141:14–15, Jan. 1959. **DWB**—A medium strong sea smoke as observed aboard M/S Pericles, 35°45′N, 73°50′W on Dec. 8, 1958, between 0300 and 0400 is reported because of its peculiarity. Wind north 3–4, temperature in air +9°, in sea +26°C, relative humidity 54%, pressure 1024 mb. *Subject Heading:* **1. Steam fog.**—*W.N.*

CLOUDS

See also: **Tables of cloud forms** (Netherlands Met. Inst.), 11.8–8; **Cloud measurement from aircraft motion pictures** (Ronne), 11.8–140; **Convective clouds** (Shishkin), 11.8–183; **Band structure of atmosphere** (Kuettner), 11.8–254; **Ceiling frequencies, U. S.** (Hunter et al.), 11.8–301.

11.8–261 551.576(6)

Schaefer, Vincent J. (*Munitalp Foundation, Inc., Greenwich, Conn.*), **Cloud explorations over Africa.** *New York Academy of Sciences, Transactions*, Ser. 2, 20(6):535–540, April 1958. 7 refs. **DLC**—The author gives an account of his trips to various areas of southern Europe and Africa during late October and early November, 1957. His concerted effort in the observation of various clouds over various parts of Africa gives a comprehensive outlook as to why different parts of that continent have certain characteristic weather conditions. The heavy cumulus cirrus and stratus cloud systems of the intertropical convergence zone of west, central and east Africa were observed to behave differently. A probability of important changes in the moisture pattern of the area underneath these clouds, is envisaged by the author, if silver iodide or dry ice seeding were applied regularly. Evening thunderstorms occurred frequently in South Africa, particularly around the Drakensberg Mountains. The jet-stream clouds in the northeast portion of South Africa included cirrus, cirrocumulus, altocumulus billows and wave clouds. Other spectacular clouds mentioned are the "easterly wave" cloud system over the Zanzibar island and several instances of mother-of-pearl clouds near the equator, as well as unusual cloud systems over southern Europe. *Subject Headings:* **1. Cloud observations 2. Africa.**—*N.N.*

11.8–262 551.576.1:551.515.4:778.3

Koldovský, Milan (*Geophysical Inst., Czech. Acad. Sci., Hradec Králové*), **Photographic observation of the development of a thunderstorm cloud.** *Studia Geophysica et Geodaetica*, Prague, 3(1):93–97, 1959. 4 figs., table, 10 refs. **DWB**—Photos taken each 2 min between 1641–1701 C.E.T., June 8, 1958, of a thunder cloud development over Jinolice, Czechoslovakia were analyzed. The results discussed are presented in graphs and tables. It is confirmed that each new thunderstorm cell grows larger at the expense of a preceding one, however, the fact that new cells appeared simultaneously on the windward and the sunny side, or rather the reverse side of the cloud system with respect to its motion, is in disagreement with data in the "Thunderstorm Project." The ice phase at the three cloud towers at 10,700 m, 11,250 m and 10,950 m altitude shows that supercooled water droplets existed at about −50°C. *Subject Headings:* **1. Cloud photographs 2. Thunderclouds 3. Supercooled clouds.**—*W.N.*

11.8–263 551.576.1:551.510.53(213)

Riehl, Herbert; Gray, William S. (*both, Chic. U.*); Malkus, Joanne S. and Ronne, Claude (*both, Woods Hole Oceanog. Inst.*), **Cloud structure and distributions over the tropical Pacific.** Woods Hole Oceanographic Institution, Contract Nonr 1721(00) and Contract Cwb 9509 (and Chicago. Univ., Contract N6ori-02036), Technical Report No. 5, Jan. 1959. 61 p. 10 tables. Numerous charts and photos in appendices. **DWB** (M:551.46 W894)—A successful study of cloud structures in the various sky types has been recently accomplished. It is recommended that cloud observations in the tropical areas of the world should be governed by the upper level conditions. It is not even safe to predict tropical cloud or precipitation physics parameters out of a context that would have to be inclusive of the upper-tropospheric

(~200 mb) flow patterns. *Subject Headings:* **1. Cloud structure 2. Tropical clouds 2. Uppe air flow patterns 3. Tropical regions.**—*N.N.*

11.8–264 551.576.1

†Rittberger, W. (*Met. Inst. Techn. Hochschule, Karlsruhe*), **Zur Struktur der Wolken.** [O the structure of clouds.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A* Vienna, 11(3):333–367, **1959.** 9 figs., 20 tables, 57 refs., 11 eqs. German, English and Frenc summaries, p. 333–334. **DWB, DLC**—Measurements of drop size, water content and visibilit in clouds have been carried out from January till May 1953 and from September 1954 t February 1955 on the Feldberg (1493 m) in the southern Black Forest. The drops of th different spectra have a mean diameter between 6 and 30μ; the diameters of the largest meas ured drops lie between 50 and 60μ. The water content shows values between 0.003 and 1.5 g/m^3, whereby more than 90% of all measurements lead to a water content below 0.50 g/m A simple relation between visibility, drop size and water content according to the formula o TRABERT does not exist. A close connection between the form of the spectra and precipitation has been found. In periods without or with only slight precipitation narrow spectra ($\bar{d}<12.0\mu$ prevail, in periods with persistent precipitation broad ones ($\bar{d}>12.0\mu$). All measurements i elevated fog make an exception, showing broad spectra with d between 13 and 17μ without an precipitation. The simultaneous existence of the 3 phases: water vapor, liquid water and ic particles over longer periods has been stated; the ice crystal precipitation theory of BERGERO and FINDEISEN for the mechanism of precipitation can therefore not hold in the generall accepted extent. An examination of the problems of cloud physics appears to be necessary not only in thermodynamical respect, but also in the sense of colloid physics according t SCHMAUSS. *Subject Headings:* **1. Cloud structure 2. Cloud drop size 3. Water content o clouds 4. Visibility in clouds.**—*Author's abstract.*

11.8–265 551.576.31:551.509.324.1:551.576.

Krill, A. D., **Diurnal variation of stratus cloud at Pembroke Dock.** *Meteorological Magazine*, London, 88(1040):45–47, Feb. **1959.** fig., table. **DWB, DLC**—The diurna variation of sheets of stratus cloud in a moist maritime air stream was examined for the perio July 1952–Dec. 1956, with the purpose to facilitate forecasting of clearing. The departur of the 900 mb temperature from the 900 mb value of the saturated adiabat through the se surface temperature is discussed as a useful stability parameter. *Subject Headings:* **1. Diurna cloud variations 2. Stratus dissipation forecasting.**—*W.N.*

PRECIPITATION

See also: **Rainfall-runoff simulating apparatus** (Zimont), 11.8–152; **Flood-producing rainfall, Spain 1957** (García Miralles, Carrasco Andreu), 11.8–158; **Natural aerosols and nuclear debris in precipitation** (Drevinsky et al.), 11.8–180; **Precipitation variations in relation to frontal zones** (Gregor, A.; Gregor, Z.), 11.8–208; **Relation between precipitation, radiation, evaporation and humidity** (Evseev), 11.8–213; **NW monsoon and rainfall, N. Australia,** (Treloar), 11.8–243; **Rainfall and runoff relation, Damodar catchment** (Iyengar, Palit), 11.8–285; **Rainfall in Asturias** (Mateo Gonzales), 11.8–297; **Rainfall maps, Canada** (Bruce), 11.8–300; **Water yield from rain and fog, Bavarian Forest** (Baumgartner), 11.8–309.

11.8–266 551.577:551.573:551.585.5(549

*†Ahmad, Mahammad Shafi, **Précipitations, évapotranspiration et aridité en Pakista Occidental: essai d'interprétation géographique.** [Precipitation, evapotranspiration an aridity in West Pakistan: effort at geographical interpretation.] *Rennes. Universit Faculté des Lettres & Sciences Humaines. Laboratoire de Climatologie, Travaux*, No. 1, 1958 91 p. 15 tables+tables in appendix, 29 refs., 46 eqs. **DWB** (M(055) R414tr)—Two method have been used and compared with each other for the purpose of estimating aridity in Wes Pakistan. The first is THORNTHWAITE'S method (1948). Working on it, various aspects o aridity, such as annual water need, indices of aridity and humidity, effective moisture and it seasonal variation, etc., are estimated and tabulated. The data drawn upon are 28 yea averages (1875–1902) of monthly rainfall at 159 stations and averages of monthly temperatur

for the same period at 31 stations. The second part of the thesis consists of criticism of THORNTHWAITE's method and the introduction of the method proposed by PENMAN. PENMAN's formulas give the natural evaporation from free water surfaces in terms of ordinary meteorological elements (temperature, relative humidity, sunshine hours and wind speed). In accordance with this method data were collected at the Agricultural-Meteorological Observatory at Quetta (lat. 30°12′, alt. 1700 m.). Upon comparison on a weekly basis it was found that the calculated values showed a fairly good agreement with the observed ones. *Subject Headings:* **1. Aridity index 2. Precipitation data 3. Evaporation-precipitation-temperature relationships 4. West Pakistan.**—*I.S.*

11.8–267 551.577.11

Malkowski, G. (*Berlin-Dahlem*), **Zur linearen Anordnung nicht frontal gebundener Niederschlagszellen.** [On the linear arrangement of nonfrontal precipitation cells.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, Vienna, 11(2):252–257, **1959.** 6 figs., 3 refs. **DWB, DLC**—Possible causes of linear arrangement of showers in a homogeneous air mass are discussed. *Subject Headings:* **1. Nonfrontal rainfall 2. Precipitation cells 3. Shower formation.**—*Author's abstract.*

11.8–268 551.577.31(479)

Baratinskaia, G. N., **Sutochnyĭ khod veroiatnosti osadkov na Kavkaze.** [Daily variations of precipitation probability in the Caucasus.] *Leningrad. Universitet, Uchenye Zapiski*, No. 269:135–150, **1959.** 4 figs. (Also its *Ser. Geograficheskikh Nauk*, No. 13.) **DLC**—On the basis of diurnal variation of precipitation probabilities in the Caucasus there are two types of stations, viz: coastal stations and continental stations; including high mountain, foothill and steppe stations. Continental stations have a greater amplitude of fluctuation of daily variation of precipitation probabilities than do coastal stations. All coastal stations with the exception of Sochi, are characterized by a maximum probability of precipitation in the afternoon hours and minimum in the early morning hours. In the high mountains the variation of rainfall probabilities is caused by heat convection throughout the entire year; it is characterized by maximum precipitation probability in the afternoon and a minimum at night. In stations situated in foothills, wide valleys and on large plateaus in the midst of mountains there appeared a double daily variation of precipitation probabilities, one component of which is opposite to the daily variation of precipitation probability in the mountains. The maximum precipitation probability is at the end of the night or morning and minimum in the afternoon hours. Besides this precipitation the most probable is that of convective origin falling at the end of the day; the minimum occurs in the evening or in the first half of the night. The daily distribution of precipitation in the steppe region is complex; in the case of Stavropol' there is a high precipitation probability in the afternoon and morning hours and a minimum in the forenoon hours and at the beginning of night, etc. *Subject Headings:* **1. Diurnal rainfall variations 2. Rainfall probability 3. Caucasus, U.S.S.R.**—*I.L.D.*

11.8–269 551.577.31(774) 551.524.36(774)

Baten, William Dowell; Eichmeier, A. H. and Kidder, E. H., **Rainfall probabilities in Michigan.** *Michigan. Agricultural Experiment Station, East Lansing, Quarterly Bulletin*, 42(1):142–145, Aug. **1959.** 4 p. 3 figs. **DWB** (M78.1 B328ra), **DLC**—Daily precipitation data for Ann Arbor, Coldwater, East Lansing, Higgins Lake, Monroe, Saginaw, South Haven and Traverse City in the lower peninsula and Chathan and Ironwood in the upper peninsula, all in Michigan, are discussed. Curves of the various probabilities for the upper peninsula are higher than those for the lower peninsula. These curves serve as directive indexes for the farmer and aid in the prediction of precipitation in similar areas. They include data on maximum and minimum temperatures for the day, precipitation, snowfall and other pieces of information. *Subject Headings:* **1. Rainfall probability 2. Diurnal precipitation data 3. Maximum temperatures 4. Minimum temperatures 5. Michigan, United States.**—*N.N.*

11.8–270 551.577.32:551.577.2(81)

Schröder, Rudolf (*Santiago de Chile*), **Die Niederschlagsjahreszeiten Brasiliens.** [The rainy seasons in Brazil.] *Petermanns Geographische Mitteilungen*, Gotha, 102(4):264–270,

1958. 5 figs., map, graphs, 5 refs. Portuguese summary, p. 264. **DLC**—Using the rainfa data in the **Atlas Pluviométrico de Brasil** which covers the period 1914–1958, the autho selected 152 representative stations where rainfall data were used as the basis of an analysi of the rainfall seasons of Brazil, and the temporal and spatial distribution of rainfall. Th relative pluviometric coefficient of ANGOT, which expresses the ratio of actual rainfall per mont to that which would be the monthly rainfall if the rainfall were evenly distributed ever day of the month, is used. On the basis of this coefficient there were established seven classe characterized by temporal rainfall distribution and maps showing the classes to which in dividual months at particular stations belong. Three principal types of rainfall periods ar described; namely: (1) rain period-dry period (well pronounced) with rain period either in th summer or winter half of the year; (2) rain period-dry period-rain period-dry period with distinct rain period occurring twice a year; and (3) practically continuous rainfall. The zona and meridional distribution of the rainfall is described with the aid of graphs showing th distribution of pluviometric coefficients for the coastal region, for the regions around th central meridian and for the western regions. Maps showing the seasonal distribution c rainfall in Brazil, and rainfall seasons of Brazil are included. *Subject Headings:* **1. Rain seasons 2. Rainfall distribution 3. Brazil.**—*I.L.D.*

11.8–271 551.577.37:551.579.4(52

Aki, Koichi; Inokuti, Syohei and Takahasi, Yutaka, **Some considerations on flood flo relation between storm rainfall and storm runoff on the Chikugo river.** (In: I.U.G.G. Associa tion of Scientific Hydrology, Symposia Darcy, Dijon, Sept. 1956 [**Proceedings**], Vol. 3, pub **1957**(?). p. 64–70. 2 figs., 6 tables.) **DWB** (M79 161sym)—A statistical analysis of th runoff conditions in the headwaters of the Chikugo River basin in northern Kyushu, as we as the draining conditions, has been made in order to ably treat analytically the change tha has occurred in the flood feature over a number of years. More detailed hydrological dat have been made accessible for the first time. From the study conclusions have been reache on the regime of precipitation over the basin, the amplitude of the periodical variation, th frequency and progress of the flood waters and the changes in the regime as they affect th physical meaning of the related data. *Subject Headings:* **1. Statistical analysis of runo 2. Flood-rainfall data analysis 3. Precipitation regime 4. Chikugo River, Japan.**—*N.N.*

11.8–272 551.577.37:551.515.4(94

Brunt, A.T., **Notes on the Mackay storm of February, 1958.** (In: Australia. Bureau c Meteorology, **Conference on estimation of extreme precipitation, Melbourne, April 1958** Melbourne, Dec. **1958.** p. 229–244. 4 figs., table, ref.) **DWB** (M77.31 C748c)—Durin the night of February 17, 1958, rainfall to the west and northwest of Mackay brok Australian records and reached world class. Falls of 21 inches in 5 hours an 23 inches in 6 hours were supported by others of near equal intensity. Depths approache those of maximum thunderstorm rainfall for short durations and were approximately equa to the thunderstorm model over a 12 hour period. *Subject Headings:* **1. Thunderstorm rainfa 2. Record rainfall 3. Mackay, Queensland.**—*Author's abstract.*

11.8–273 551.577.5

Wind, R. Hzn., **Interception of precipitation by the vegetation.** (In: I.U.G.G. Associatio of Scientific Hydrology, Symposia Darcy, Dijon, Sept. 1956 [**Proceedings**], Vol. 3, pub. **1957**(? p. 379. 8 refs.) **DWB** (M79 161sym)—A varied amount of intercepted rainfall reaches th ground surface depending on the character (rain, hail, snow), intensity and dispersion c precipitation, wind conditions during and immediately after the rainfall and the compositio of the vegetation. For nearly 100 years the problem of interception has been studied i England, Finland, France, Germany, Italy, Switzerland, Canada, the U. S. and Japan and reviewed briefly in this report. Self-recording raingages and the intensive research in th area of overall interception and the horizontal precipitation (dew, fog, hoar frost) as significa in the calculations of evaporation from water balance are discussed. *Subject Heading:* **1. Pre cipitation interception.**—*N.N.*

11.8–274 551.577.7(43)

Hinzpeter, A. (*Hannover*), **Radioaktiv verseuchtes Wasser?** [Radioactive contamination of water?] *Naturwissenschaftliche Rundschau*, Stuttgart, 12(9):349, Sept. **1959. DWB, DLC**—The increase in the "total radioactivity" of rainwater (as much as 60 or 150 fold in some instances) has still left the water far below the permissible concentration. If water is to be used permanently as drinking water for large populations then a liter of water of unknown chemical composition should not have more than 22 nuclear disintegrations per minute (0.1×10^{-7} microcurie/cm³). This disintegration rate is set very low with a safety factor of 10 since in the worst cases the radioactivity could consist of 100% of the poisonous radioactive substances radium and thorium. Next to these substances strontium 90 is the most poisonous substance. Strontium 90 produces 180 disintegrations per minute (0.8×10^{-7} microcurie/cm³). The radioactivity of rainwater consists largely of a number of partially non-poisonous radioactive substances. The 150 fold superconcentrations in a liter of water or the disintegration rate of 300 per minute is injurious only as a result of the fraction of strontium 90 or radium or thorium present in the rainwater. The toxicity of rainwater cannot be determined by its total radioactivity but only by its percent of the actually measured strontium 90 content in a liter of rain water. The mean total activity and thereby also the strontium 90 activity of cistern water has doubled during the past year in Germany. *Subject Headings:* **1. Radioactive rainwater 2. Strontium 90 3. Germany.**—*I.L.D.*

RAIN, SNOW OR HAIL

See also: **Electric discharges from snow squalls** (Norinder, Knudsen), 11.8–141; **Heat content of air during shower weather** (Troeger), 11.8–190; **Advection fog over snow** (Kliuchnikova), 11.8–259; **Snow, Khibiny Mountains** (Medvedev), 11.8–294; **Snow distribution, Bavarian Forest** (Baumgartner), 11.8–309.

11.8–275 551.578.11:551.509.617:551.574.11:545

Gübeli, Otto, **Zur Bestimmung von Ultraspuren von Silberjodid in Regenwasser.** [Determination of minute traces of silver iodide in rainwater.] *Zeitschrift für Angewandte Mathematik und Physik*, Basel, 10(3):310–314, **1959.** fig., eqs. English summary, p. 314. **DWB, DLC**—A process is given for determining ultra-traces of silver iodide in rainwater following seeding experiments designed to influence precipitation. After considering the physicochemical properties of silver iodide a 50–1 sample of rainwater has been vaporized in a rapid 'thin-film' vaporizer. The residue is reduced by dissolving with soda. The reduced silver can be separated from the iodide by extraction with water. The quantitative analysis is then made by spot test on the basis of drops placed on filter paper saturated in *p*-dimethylaminobenzilidenerhodanine, compared with drops of known content or alternatively with non-seeded rainwater. The quantitative analysis of the iodide is made with the aqueous, soda-alkaline, silver-free extract. The iodide traces are enriched, oxydized, and made to react on strips of paper soaked in fluoresceinsodium. *Subject Headings:* **1. Rainwater analysis 2. Silver iodide in rainwater.**—*Author's abstract.*

11.8–276 551.578.41:537.2

Schrack, Roald A., **The electrostatic field and the symmetry of snowflakes.** *Washington Academy of Sciences, Journal*, 48(9):273–275, Sept. **1958.** 6 foot-refs. **DLC**—Snowflakes in their natural and artificial forms have induced scientists to advance several theories. This paper is one of such theories attempting to account for both the observed symmetry of individual snowflakes and their infinite variations. It does not consider the environmental conditions which control the rate of snowflake growth and type of snow crystals formed. *Subject Heading:* **1. Snow crystal forms.**—*N.N.*

11.8–277 551.578.43

Bik, I. K., **Sneg v period teploĭ pogody.** [Snow in the warm-weather period.] *Priroda*, Moscow, No. 6:113, June **1959.** fig. **DWB, DLC**—A case of heavy snowfall—up to 20–30 cm in some places—that occurred in the beginning of May 1957 is reported by a reader. The combination of young leaves and grass with snow was very unusual. *Subject Headings:* **1. Snowfall extremes 2. Snowstorms in spring.**—*A.M.P.*

11.8–278 551.578.46:547.54(931)

Wilson, A. T. (*Div. Nuclear Scien., Private Bag, Lower Hutt, New Zealand*), **Organic nitrogen in New Zealand snows.** *Nature*, London, 183(4657):318–319, Jan. **1959.** table, 5 refs. **DLC**—The depletion of nitrogen fixing bacteria in the native and commercial exotic forests of New Zealand has become a problem that has created much concern. The author has investigated the possibility of supplying the nitrogen via the atmosphere. It was found that precipitation in New Zealand contains some organic nitrogen that does not originate from contamination and that several pounds of nitrogen per acre are being deposited on New Zealand each year from the surrounding ocean. *Subject Headings:* **1. Nitrogen content of precipitation 2. Snow composition 3. New Zealand.**—*N.N.*

11.8–279 551.578.466

Prodan, T. K., **Neobychnye iavleniia v prirode.** [Unusual phenomena in nature.] *Priroda*, Moscow, No. 2:128, Feb. **1959. DLC**—On Feb. 5, 1958 lumps of snow of cylindrical shape varying in size from 3–5 cm in diameter and 15–35 cm in length were observed. One of the largest weighed 5.8 kg. These rollers formed when fresh snow fell upon a thick snow cover. It was a wet snow. The air temperature was −0.9°C. The wind which was 10 12 m./sec at first rolled small spherical rollers which gradually became cyclindrical in shape. Photographs of the rollers are presented. *Subject Heading:* **1. Snow surface forms.**—*I.L.D.*

11.8–280 551.578.7:551.510.52/.53:629.135.2

Kogan, Beletskiĭ, G. I., **Grad na bol'shikh vysotakh.** [Hail at great heights.] *Priroda*, Moscow, No. 6:79–81, June **1959.** 2 figs., eq. **DWB, DLC**—As a result of continuous flights of jet airplanes in the upper troposphere and the lower stratosphere it has been found that heavy hailstorms may occur at great heights (13,000 m). This is confirmed by several jet plane pilot reports on sudden hails and photos showing the damage inflicted to the front part of a plane. The author discusses the causes and process of development of such clouds in highly humid and strongly warmed up air masses under the influence of cold or stationary warm fronts. *Subject Headings:* **1. Hailstorms at great heights 2. Hail damage to aircraft.** —*A.M.P.*

11.8–281 551.578.7:632.116.3(773)

Stout, G. E.; Blackmer, R. H., Jr.; Changnon, S. A., Jr. and Huff, F. A., **Preliminary report on the hail hazard in Illinois to the Crop-Hail Insurance Actuarial Association, Chicago, Illinois from the Illinois State Water Survey, Urbana, Illinois.** Jan. 31, **1959.** 33 p. 18 figs., 5 tables, 10 refs.—Meteorologic and topographic factors affecting hail risk in Illinois where studied by R. H. Blackmer, Jr. of the Illinois State Water Survey at the University of Illinois since Feb. 1, 1958 under a cooperative agreement with the Crop-Hail Insurance Actuarial Association (CHIAA). Case histories in the past and present were studied using radar surface and upper air maps, area of thunderstorm system, speed of movement, number of cells, synoptic patterns and U. S. W. B. climatic statistics. In plains states a definite condition of hail loss with elevation is shown. In Illinois not much difference in elevation exists but there is a marked regional variation. Highest incidence occurs in the Springfield Plain in NW part and 2 other hilly parts. Lowest incidence is in the Mississippi and Illinois River valleys and along Lake Michigan. Strong variations occur from year to year and even from decade to decade. Detailed results of study based on 1953–7 records are given in graphs and tables. June and then July are worst months. Hail occurs almost every day somewhere in Illinois, and on ½ days there is damage. Results of size frequency studies for June, July, Aug. and Sept. in Alberta and April–Oct. in Denver area, and May–Aug. in Illinois show much greater frequency of golfball size or greater in Denver area than in Alberta and practically none in Illinois. Statistics are based on reports from a volunteer network of farmers sending postcards whenever pertinent. State was divided into a grid of ¼° squares of latitude and longitude. Areal extent average length 20–30 mi, width 6–7 mi, area 100–210 sq. mi, direction NW–SW with maximum frequency from W (shown in complex wind roses). *Subject Headings:* **1. Hail hazard studies 2. Hail statistics for Illinois 3. Hail reporting networks 4. Illinois.**—*M.R.*

11.8–282 551.578.7

Visser, S. W., **Rijplawines.** [Hoarfrost avalanches.] *Hemel en Dampkring*, The Hague, 57(6):159–160, June **1959. DWB, DLC**—Comments on the article of LEVERT and SCHARRINGA (*Hemel en Dampkring*, May **1959**) **The dense fog and hard rime in Feb. 1959,** and reply by DE BOER. The author describes the avalanches of hard and soft rime from trees at Ellecom after a ten day period of hard rime. *Subject Headings:* **1. Hard and soft rime 2. Netherlands.** —*A.V.*

11.8–283 551.578.71

List, Roland, **Kennzeichen atmosphärischer Eispartikeln, 1. Teil, Graupeln als Wachstumszentren von Hagelkörnern.** [Characteristics of atmospheric particles, Pt. 1, Graupel as growth centers of hailstones.] *Zeitschrift für Angewandte Mathematik und Physik*, Basel, 9A(2):180–192, **1958.** 20 figs., 9 refs. **DLC.** Reprinted as *Switzerland. Eidgenössische Kommission zum Studium der Hagelbildung und der Hagelabwehr, Wissenschaftliche Mitteilungen*, No. 15, **1958. DWB.** Pt. 2, **Hagelkörner.** [Hail stones.] *Zeitschrift für Angewandte Mathematik und Physik*, 9A(3):217–234, **1958.** 48 figs., 10 refs. English summary, p. 234. **DLC**—In Pt. 1 the results of observations and measurements at Weissfluhjoch (Switzerland) from 1953 1957 on 60 samples of graupel and hail precipitation to determine the process of growth of large hailstones from small ice particles are reported. The various phases of development of an ice particle into hail (transition by sublimation from an ice particle into a snow crystal and by accretion of water droplets from a snow crystal into soft hail, then into small hail or a particle of clear ice, and finally into a hailstone) are discussed. Factors governing the formation and structure of each crystal type, their size and form distribution, size of their components, their density, crystallographic characteristics, and the number of ice-forming nuclei are examined. In Pt. 2 photographs and pictures of thin sections in transparent or polarized light show a number of different possibilities of external and internal structure of hailstones. The relationship between air bubbles in the ice and the single crystals are explained, also in connection with the concentration of active atmospheric ice nuclei. *Subject Headings:* **1. Ice crystal formation 2. Ice crystal photographs 3. Hailstone formation.**—*Author's abstract and SIPRE.*

11.8–284 551.578.71:533.6

List, Roland, **Zur Aerodynamik von Hagelkörnern.** [Aerodynamics of hailstones.] *Zeitschrift für Angewandte Mathematik und Physik*, Basel, 10(2):143–159, **1959.** 12 figs., 3 tables, 12 refs., eqs. English summary p. 159. **DLC.** Reprinted as *Switzerland. Eidgenössische Kommission zum Studium der Hagelbildung und der Hagelabwehr, Wissenschaftliche Mitteilungen*, No. 19, **1959. DWB** Wind tunnel experiments in the cold chamber of the Eidgenössisches Institut für Schnee und Lawinenforschung with model spheres and 4 natural hailstones of different shapes, showed that (1) the characteristic rough shape of a hailstone has a function in connection with aerodynamic influences during growth, and (2) that natural forms are more effective than mathematically idealized shapes. Instrumental description and operation are given. Experimental results shown in graphical and tabular manner are included. *Subject Heading:* **1. Hailstone aerodynamics.**—*W.N.*

HYDROMETEOROLOGY

See also: **Sec. F3, p. 1239.**

11.8–285 551.579:551.577

Iyengar, N. S. and Palit, B. N., **Rainfall and runoff relation for the Damodar catchment during the monsoon months.** (In: I.U.G.G. Association of Scientific Hydrology, Symposia Darcy, Dijon, Sept. 1956 [**Proceedings**], Vol. 3, pub. **1957**(?) p. 271–278. 2 figs., 4 tables.) **DWB** (M79 I61sym)—The possibility of extending the discharge data of Damodar River and drainage area (7,690 sq mi), and correlating the runoff with the rainfall data of recent years, has been studied. Thus, by this relationship it would be possible to estimate the runoff during the previous years. Study reveals considerable variation in the distribution pattern.

Subject Headings: **1. Rainfall-runoff relationships 2. River discharge calculations 3. Damodar River, India.**—*N.N.*

11.8–286 551.579.4(282.281.6)

*Balay, Marciano A. (*Technical Adviser, Argentine Navy Hydrographic Office*), **Causes and periodicity of large floods in Rio de la Plata (flood of July 27 and 28, 1958).** *International Hydrographic Review*, Monaco, 36(1):123–151, July **1959.** 14 figs., 4 tables, foot-refs. **DWB** (M79.4 B171ca), **DLC**—The geographical location of the sea coast of Buenos Aires Province and the Rio de la Plata is given. Storm waves in the area are catastrophic. The Argentine Navy Hydrographic Office has records of all tidal predictions. An account is given of the high floods in the area in general and the particular meteorological factors that have caused these high floods as far back as 1905. The characteristics of worst flood in the history of Argentine, the flood of July 27 and 28, 1958, are summarized. Hourly weather and atmospheric conditions as well as the causes and periodicity of the flood are given. The pressure gradient between the anticyclone in the south and the depression center north of the Plata was 40 mb (30 mm) during the major part of the flood. *Subject Headings:* **1. Record floods 2. Flood-tide relationships 3. Rio de la Plata, Argentina.**—*N.N.*

11.8–287 551.579.4:551.501.45(477)

†Onufrienko, L. G., **Raschet gidrografa talogo stoka i otdel'nykh ego komponentov.** [Calculating the hydrograph of meltwater runoff and its individual components.] *Kiev, Ukraine. Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy*, No. 19:25–47, **1959.** 15 figs., 11 tables, 17 refs., 4 eqs. **DWB**—In the construction of the theoretical hydrograph of meltwater runoff of a small river, one of the most important factors is the computation of the velocities of runoff on the slope and in channel and the construction of runoff on the basis of an isochrone. Computation of unit areas of simultaneous runoff illustrated by the variation of the basic hydrometeorological elements during the snow melt period in spring of 1951 in the basin of the Lipino ravine, the basin flow of meltwater from the catchment basins of the Pridesniansk runoff station, dependence of time of basin flow (τ) upon mean width of open catchment basins, etc. indicate the decisive role of snow reserves and intensity of snow melt, rate of flow of melt water runoff to the recording station and runoff loss at the surface, retention and infiltration in the soil, in determining the height and form of the meltwater hydrograph. A comparison of the velocities of flow from slopes measured with the aid of dyes with velocities computed on the basis of the displacement of phases $\tau_{t\max}$ and $\tau_{Q\max}$ enabled the computation of unit areas according to a simplified scheme. On the basis of $\tau_{t\max}$ and $\tau_{Q\max}$ the relationships $\tau=f(B)$ and $v=f(B)$ were obtained for 1956 by means of which the unit values of simultaneous runoff for 2-hour intervals could be computed; here B = mean width of the open catchment area and $B=F/1.8\sqrt{F}$ or $B=\alpha\sqrt{F}$. The coefficient of meltwater runoff was computed by the equation of water balance, namely $\Delta W=f(p)$ and $\gamma=f(\beta,(\sqrt{F}/i))$. This method of computing the meltwater hydrograph can be used to forecast approximately the spring water hydrograph. This procedure is outlined. *Subject Headings:* **1. Snow melt runoff calculations 2. Hydrographs 3. Pridesniansk runoff station, Ukrainian S.S.R.**—*I.L.D.*

11.8–288 551.579.4(545.2)

Uppal, H. L. and Sehgal, S. R. (*both, Irrigation and Power Research Institute, Punjab*), **The unprecedented floods of October 1955 in Punjab and a discussion of measures to deal with the same.** (In: I.U.G.G. Association of Scientific Hydrology, Symposia Darcy, Dijon, Sept. 1956, [**Proceedings**], Vol. 3, pub. **1957.** p. 14–21. 3 figs., 5 tables.) **DWB** (M79 I61sym)—In the first week of October 1955 unexpected unusually heavy and continuous rains fell in the Punjab hills and plains. Many rivers were flooded. The floods and damage were caused by the heavy, excessive rainfall, high river discharges, spills and breaches in river embankments, denudation of foothills, siting of village habitations in low places and inadequate waterway below bridges. The report discusses the frequency and intensity of floods in the area and concludes that the rivers Ravi, Jamma, Sutlej and their headworks have regression lines that indicate increases of the peak discharges during recent years. Conclusions are reached concerning possible plans for each of these rivers above particular headworks. *Subject Headings:* **1. Record floods 2. Major flood producing storms 3. East Punjab, India.**—*N.N.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

11.8–289 551.58:581.54:634.9(52)

Sekiya, H., **On the timber line in Mt. Fuji.** *Japan. Meteorological Agency. Tokyo, Memoirs of Industrial Meteorology,* 22(1):23–29, **1958.** 10 figs., 2 refs. In Japanese; English summary p. 29. **DLC**—It is well known that the region of Mt. Fuji and its vicinity has primeval forests. In general, height of trees rapidly decreases with altitude. In order to clarify this characteristic, observations were carried out with aid of temporary observation networks in the periods 16–26 July 1951 and 10–26 August 1952, and this paper briefly gives the results obtained. The distribution of the height of larches in the region of Mt. Fuji is shown. The change of the height is proportional to the mean temperature of the period from May to October and to the wind velocity along the mountain slopes. These results may be applicable to all over Japan and the Northern Hemisphere. The effect of snowfall is most important in the shrubby zone. *Subject Headings:* **1. Tree line 2. Climate and tree growth 3. Mt. Fuji, Japan.**—*Author's abstract.*

CLIMATE OF PARTICULAR PLACES

See also: **Annual report** (Sonnblick-Verein, Vienna), 11.8–2; **Tbilisi Hydrometeorological Research Institute session** (Khmaladze), 11.8–18; **Climate of East Germany** (Seifert), 11.8–315.

11.8–290 551.582:551.43(480) 551.584.3(480)

Ashwell, I. Y., **Climatic contrasts in Finnish Lapland.** *Weather,* London, 14(2):46–56, Feb. **1959.** 6 figs., 2 tables, 5 refs. **DWB**—A short but intensive survey (hourly observation) of the meteorological conditions in the a) high mountain, b) lowland and c) low mountain sections of extreme northern Finnish Lapland was made in Aug. and Sept. 1957 during the British Schools Exploring Society Expedition. Comparison is made among the records obtained at Station A (347 m), B (444 m) and C (568 m) and at the nearest regular meteorological station at Pallasjärvi (278 m) which is 60 km S of the area for the period Aug. 13 - Sept. 9, 1957. Pressure, wind, temp., sunshine and normality of period compared with other years, is discussed and data presented for these elements and for vapor pressure, soil temp. at 4 in., cloud, grass minimum temp. in tables and on a graph. Meteorological sites and equipment of 3 stations are shown in photos. Surrounding topography and equipment are clearly described and illustrated. *Subject Headings:* **1. Comparative climatic data 2. Topographic effects on climate 3. Microclimatic data 4. Climate of Finnish Lapland 5. Finnish Lapland.**—*M.R.*

11.8–291 551.582(235.24) 551.511:551.513.1(235.24)

†Flohn, Hermann, **Beiträge zur Klimakunde von Hochasien.** [Contributions towards a climatology of the Asiatic Highlands.] *Erdkunde,* Bonn, 12(4):294–308, Dec. **1958.** 11 tables, 21 refs. English summary p. 294. **DLC**—On the basis of all available data (including observations of expeditions), the author develops a climatology of the Tibetan plateau and its adjacent regions of the Central Asiatic Highlands. A detailed analysis is given of atmospheric temperature including its diurnal and annual variation and the physical causes for this variation, the characteristics of precipitation, cloudiness and relative humidity, wind regime, the daily periodicity of air temperature and radiation balance as related to the local climate of the Karakorum, the mechanism of precipitation including its relation to the general circulation and the jet stream, and of the role of the Asiatic Plateau in the general circulation as a mechanical obstacle to atmospheric flow and as an elevated heat source and cold source for the atmosphere. The classification of the climate of this region according to the KÖPPEN system and according to the "genetic classification" based upon the prevailing wind systems of the general circulation is discussed. Owing to the elevated insolation surface, the temperatures of the high plateau are about 4–9°C higher during the warm season than the latitudinal average of the free atmosphere, while the humid valleys and slopes of the Himalayas remain remarkably cool, despite their lower elevation. The daily periodicity of the winds and the frequency of

gales can be explained by vertical momentum exchange and by the fact that the highlands reach into the subtropical jet streams. The complicated precipitation mechanism consists of specific weather situations, dynamic effects and local diurnal winds. Data are presented in tables on the monthly mean air temperatures, mean and absolute daily extremes of temperature, aperiodic extremes of temperature, and mean (periodic) daily variation of climatic elements at Depsang (summer 1914) el. 5362 m, mean monthly precipitation and mean precipitation frequency in days, mean cloudiness, winds aloft, etc. *Subject Headings:* **1. Climate of Central Asiatic Highlands 2. General circulation 3. Tibet.**—*I.L.D.*

11.8–292 551.582.1(766):551.585.5

†Doerr, Arthur H. and Morris, John W. (*Dept. of Geography, U. of Okla.*), **The Oklahoma Panhandle—a cross section of the southern High Plains.** *Economic Geography*, Worcester, Mass., 36(1):70–88, Jan. **1960.** 18 figs., table, 31 foot-refs. **DWB, DLC**—The present study provides a geographic inventory of the Oklahoma Panhandle, consisting of the three westernmost Oklahoma counties—Cimarron, Texas and Beaver. The region projecting westward provides a sampling avenue that gives valuable insight into the southern High Plains. The climatological description of the area is of significant meteorological interest. The area is described as a land of contrasts where bitter cold and snow vie with blistering heat and dust. The region experiences tremendous variations in salient climatic characteristics from year to year. According to the Köppen classification the region is on the boundary line between humid and semiarid, and mostly semiarid by the THORNTHWAITE classification. Two photographs of the March 1957 blizzard are also reproduced. *Subject Headings:* **1. Climate of Oklahoma Panhandle 2. Continental climates 3. Climatic extremes 4. Oklahoma Panhandle, United States.**—*I.S.*

11.8–293 551.582.1:551.588.7:551.586:612(497.2)

Kirov, K. T., **Prinos kum klimatichnoto raĭonirane na Goliama Sofiia. (Klimatichna skitsa na VI Sofiĭski raĭon).** [Climatic classification of the Sofia metropolitan area: climatic outline of its 6th section.] *Khidrologiia i Meteorologiia*, Sofia, No. 2:24–35, **1959.** Russian and English summaries p. 35. **DLC**—The author attempts to divide the city of Sofia and its suburbs into sections, according to climatic conditions favorable or unfavorable to man, on the basis of climatological observations with and without instruments. It is established by comparative observations that the former 6th section (later part of the Kirkov and Blagoev sections) is most favorable in respect of bioclimatic conditions. It comprises the suburbs Krasno-celo, Ovcha-kupel, Gorna-bania, Pavlovo, Kniaievo, Boiana and the adjoining parts. Its advantages consist of greater freshness and ventilation of air, more sunshine (with the exception of the parts at the foot of the mountain Vitosha) and above all, less fog during the winter and greater frequency of temperature inversions. More exposure to wind in some places in this section is a disadvantage. *Subject Headings:* **1. Urban climatology 2. Climate of Sofia 3. Bioclimatology 4. Sofia, Bulgaria.**—*Author's abstract.*

11.8–294 551.582.1:551.578.45/.46(234)(47) 551.506.8(47)

Medvedev, P. M., **Zima v Khibinskikh gorakh.** [Winter in the Khibiny Mountains.] *Priroda*, Moscow, No. 2:125–126, Feb. **1959.** photo. **DLC**—The Khibiny Mountains are in the central part of the Kola Peninsula. In the valleys (920 m. above sea level) the snow cover is established finally at the end of October and remains until the end of May. On the mountain tops the first snow falls in the beginning of September. In the botanical garden in Kirovsk the snow cover is deepest in the birch stand where it amounts to 160–180 cm. In the forest zone the depth of snow cover is 1.5 m. The soil freezes slightly under the protecting snow cover. Thawing in mid-winter is rare. Temperature inversions are frequent—January, February, and March are the coldest months. Severe snow storms are frequent in the mountains and may be followed by avalanches. The snow storms begin in September and occur as late as June. Data on snow duration, snow depth and air temperature are given in the text and the distribution, growth, types and phenology of plants are discussed. *Subject Headings:* **1. Climate of Khibiny Mountains 2. Snowstorms 3. Snow cover data 4. Phenological data 5. Khibiny Mountains, Kola Peninsula.**—*I.L.D.*

11.8–295 551.582.1(584.1):92

†Miagkov, N. Ia., **Bibliograficheskiĭ ukazatel' literatury po klimatu Turkmenii.** [Bibliography on the climate of the Turkmen Republic.] Ashkhabad, **1957.** 104 p. 1429 refs. At head of t-p.: Upravlenie Gidrometsluzhby Turkmenskoĭ SSR, Ashkhabadskaia Gidrometeorologicheskaia Observatoriia. **DWB** (M(016) M618bi)—The bibliography contains 1429 entries of works pertaining to literature either directly dealing with the climate of Turkmenia or containing some information on it. It is divided into fifteen sections dealing with general and regional descriptions of the climate, radiation and heat balance, air and soil temperature and humidity, precipitation and runoff, moisture exchange, agricultural meteorology, synoptic processes, air pressure, winds, light climate, changes and variations of the climate, the meteorological network, etc. *Subject Headings:* **1. Climate of Turkmen S.S.R. 2. Climatology bibliographies 3. Turkmen S.S.R.**—*A.M.P.*

11.8–296 551.582.1(47):551.4:378

Zubkov, A. I., **Klimat SSSR (lektsii po kursu "Fizicheskaia geografiia SSSR").** [Climate of the U.S.S.R.: lectures in a course on "Physical geography of the U.S.S.R."] Leningrad, **1957.** 37 p. 9 refs. **DLC** (QC989.R49Z8)—The concise chapter on the climate of the U.S.S.R. includes information on general conditions of climate formation and the movement of air masses and fronts, as well as the distribution of meteorological elements (temperature, precipitation, snow cover and winds) in areas close to the centers of atmospheric activity and the movement of air masses. The whole country is divided into 9 climatic regions according to conditions of atmospheric circulation introduced by B. P. Alisov. *Subject Headings:* **1. Climate of U.S.S.R. 2. Physical geography 3. Alisov's classification 4. U.S.S.R.**—*A.M.P.*

11.8–297 551.582.2(461):551.577.21

*Mateo Gonzalez, Pedro (*Chief, Met. Observ. of Gijon, Spain*), **Pluviometria de Asturias.** [Rainfall in Asturias.] *Spain. Servicio Meteorológico Nacional, [Publicaciones], Serie A, Memorias,* No. 28, **1956.** 83 p. 11 figs., 2 maps (fold), tables. **DWB**—A monographic study of the rainfall in Asturias (northern Spain), giving extensive tables of the data (for 100 stations), large isohyetal charts (in color), histograms of monthly precipitation (19 stations). Complete monthly tables from beginning of records to 1955 are presented. Geographic factors, data sources, methods of smoothing and charting, the annual and seasonal variations in precipitation, regional variations, etc. are discussed in the text. *Subject Headings:* **1. Precipitation data 2. Isohyetal charts 3. Asturias, Spain.**—*M.R.*

11.8–298 551.582.2/.3(432) 551.524.36

*Petrovič, Št., **Trvanie obdobia s horúcim letom a teplotné sumy obdobia s charakteristickými teplotami na Podunajskej nížine.** [Duration of summer heat, and cumulative temperatures of periods with specified temperatures in the Danube plain.] *Meteorologické Zprávy,* Prague, 12(2/3):29–31, **1959.** 4 figs., table, 3 refs. Russian and German summaries p. 29. **DWB, DLC**—The **Climatic Atlas of Czechoslovakia** (1958) contained charts of the basic climatic characteristics for all regions of Czechoslovakia. This general information, however, must be supplemented by more detailed regional studies. Results of such a study concerning maximum temperatures in the Danube plain, the warmest region of Czechoslovakia, are reported in this paper. Data on number of days with daily mean temperatures over 5°, over 10° and over 18° are tabulated for more than 20 stations and presented in charts. *Subject Headings:* **1. Regional climatology 2. Maximum temperatures 3. Summer climate 4. Danube plain, Czechoslovakia.**—*G.T.*

11.8–299 908(675) 551.582.2:551.524.72

†*Weis, G., **Le pays d'Uvira : étude de géographie régionale sur la bordure occidentale du lac Tanganika.** [Uvira country: regional geographical study on the western border of Lake Tanganyika.] *Académie Royale des Sciences Coloniales. Classe des Sciences Naturelles et Médicales, Mémoires, in 8°, n.s.* 8(5), **1959.** 308 p. 38 figs., 26 tables, bibliog. p. 290–296. **DWB, DLC**—The chapter relating to climate deals with precipitation, temperature and climatic succession in tiers according to altitude. Decrease of temperature with altitude does not

follow accurately the theoretical thermal gradient. At 1500 m, temperature is about 1°C lower than the theoretical mean; this difference seems to reach 2°C at 2000 m, and 1°C again at 3000 m. *Subject Headings:* **1. Geography 2. Climatological data 3. Altitude effects on temperature 4. Temperature-height correlations 5. Belgian Congo.**—*A.V.*

11.8–300 551.582.3:551.577.2(71)

Bruce, J. P., **Rainfall intensity, duration and frequency maps for Canada.** *Canada. Meteorological Div., CIR-3243*, TEC-308, Aug. 28, **1959.** 9 p. 16 figs., 4 tables, 11 refs. **DWB, DLC**—A summary report on the rainfall intensity, duration, and frequency at most of the Canadian weather stations is presented. It is a comparative analysis that evaluates the isohyetal data from the eastern to western seaboards as well as from the southern points to one of the most northerly points, Victoria Island. A graphical comparison of the frequencies in the Vancouver and Victoria areas is given. Sixteen maps are included. *Subject Headings:* **1. Rainfall intensity duration frequencies 2. Isohyetal charts 3. Canada.**—*N.N.*

11.8–301 551.582.3:551.576.4(73)

Hunter, M. N.; Foster, R. I. and Scott, H. A. (*all, U. S. W. B., Wash. Natl. Airport*), **Monthly percentage frequency of ceilings 2,000 feet or higher over the United States.** *Monthly Weather Review*, Wash., D. C., 87(9):351–356, Sept. **1959.** 2 figs., 7 refs. **DWB, DLC**—Maps of the percentage frequency of occurrence of ceilings of 2000 ft or higher over the United States, excluding Alaska and Hawaii, are presented for each month. A second set of maps shows for each month the change in percentage from the preceding month. *Subject Headings:* **1. Ceiling heights 2. Climatic charts 3. United States.**—*Authors' abstract.*

CLIMATIC CHANGES

11.8–302 551.583.3:551.524.34:551.526.6:591.9

Birsteĭn, J. A., **Paleotemperatury i problema proiskhozhdeniia glubokovodnoĭ fauny.** [Paleotemperatures and the origin of abyssal fauna.] *Priroda*, Moscow, No. 5:21–28, May **1959.** 6 figs., foot-refs. **DLC**—The author provides proof that C. Emiliani's and C. Edwards' considerations on the sharp temperature changes of ocean bottom waters during the second part of the Tertiary, and A. F. Braun's conclusions on the extinction of the abyssal fauna caused by it, cannot be accepted as convincing. Available faunal data appear to indicate that great oceanic depths served as shelters wherein, protected by constant temperature, many species of primeval fauna that became extinct in shallow waters have been preserved to our time. *Subject Headings:* **1. Paleoclimates 2. Secular temperature variations 3. Marine fauna.**—*A.M.P.*

11.8–303 551.583.7:581.16:551.513.3(47)

Borisov, A. A., **O paleoklimaticheskikh usloviiakh formirovaniia glavnykh baricheskikh tsentrov sovremennogo klimata zemli.** [On the paleoclimatic conditions of formation of the main pressure centers of the present climate of the earth.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia*, 91(3):255–265, May/June **1959.** 5 figs., 3 tables, 11 refs. **DLC**—The author attempts to systematize and generalize the conceptions regarding the changes and fluctuations of the climates over the territory of the U.S.S.R. during different geologic epochs beginning with the Miocene and to indicate the principal patterns of paleoclimates and their distinguishing characteristics. The study is based upon the climatic characteristics of geologic epochs of Crimea and upon supplementary spore-pollen data from other regions of the U.S.S.R. The basic climatic characteristics of the individual regions of the U.S.S.R. during the different geological epochs are presented in a table. Maps showing the climatic regions of the U.S.S.R. during the first and second halves of the Miocene and the Pliocene on the basis of palynologic analysis, findings of suitable remains in Miocene rocks, similarity of conclusions from geographic processes and geological data, and interpretation of these data in climatological sections, are presented. The results of the study indicate the following: from the Miocene to the Holocene the climate of the U.S.S.R. underwent general cooling, partial desiccation and considerable fluctuation within the geological epochs; the most intense climatic differentiation began in the Pliocene when the present pattern of the atmospheric circulation became established; the Azores and Siberian centers of atmospheric action became established in the

Pliocene while the Aleutian and Icelandic lows developed during the Quaternary period, when also the zones of tundra and forest tundra arose. *Subject Headings:* **1. Paleoclimatology 2. Climatic changes 3. Atmospheric circulation 4. U.S.S.R.**—*I.L.D.*

11.8–304 551.583.3:550.9:539.16:546.26

Crowe, C. (*Dept. of Geodesy and Geophysics, Cambridge*), **Carbon-14 activity during the past 5000 years.** *Nature*, London, 182(4633):470–471, Aug. 16, **1958.** fig., table, 9 refs., eqs. **DWB**—Brief comment on the carbon-14 fluctuations which may be due to 1) atmospheric dilution governed by fossil oil combustion, 2) variation of the earth's magnetic field, 3) after effect of solar flares etc., or a combination of these effects. The change vs. time is graphed and a table features the different allowances used by several laboratories (ranging from −375 to +525 years) in relation to the radiocarbon dating formula. *Subject Headings:* **1. Carbon-14 variations 2. Geological climatology 3. Paleoclimates.**—*W.N.*

11.8–305 551.583.7:551.332

Stelzer, F. (*Vienna*), **Die geologische Vorzeit und ihr Klima.** [The geologic past and its climate.] *Wetter und Leben*, Vienna, 10(5/7):98–102, **1958.** 6 refs. **DLC**—A concise review of the types of evidence for determining paleoclimates, the radiocarbon method for determining the age of geologic strata and the climatic characteristics and climatic zones of the various geologic periods from the Pre-Cambrian to the Quaternary. The nature of the biological, lithogenetic and geomorphological evidence for paleoclimates, the usefulness and limitations of the radiocarbon, radiohelium, radiostrontium, radiopotassium and argon methods for determining ages of geological deposits and the possible causes of climatic change are summarized. In the Pre-Cambrian, traces of glaciation are present in North America, Lapland, Scotland, China and Australia. The climate was cooler than in subsequent warm periods. In the Cambrian and throughout the entire Paleozoic, a uniform humid warm climate prevailed. During the Silurian the Northern Hemisphere was warm and arid. The Devonian is characterized by climatic differences; Central Europe, Canada, North Asia and Australia had a warm humid climate, arid conditions prevailed in the rain shadow of the Caledonian mountain chain, and South Africa was characterized by a cold climate. In the Carboniferous, the Northern Hemisphere was warm and probably moist. In the transition to the Permian, the continents of the Southern Hemisphere showed incipient glaciation and in the Northern Hemisphere arid climates alternated with steppe climates. The Permian was marked by continued aridity in the Northern Hemisphere and glaciation in the Southern Hemisphere. The Triassic climate resembles the Permian but at its end, conditions were warmer and more humid. The Jurassic climate was warmer than the present time; in Europe a cold boreal zone and warm Central European and Mediterranean zone prevailed. These climatic zones continued into the Cretaceous except that the boundaries were displaced northwards. The Lower Tertiary had distinct climatic zones and a gradual cooling began in the Upper Tertiary. The gradual climatic deterioration continued into the Quaternary during which a number of glaciations occurred. *Subject Headings:* **1. Geological climates 2. Paleoclimatology.**—*I.L.D.*

MICROCLIMATOLOGY

See also: **Climatic contrasts, Finnish Lapland** (Ashwell), 11.8–290.

11.8–306 551.584

Gol'tsberg, I. A., **Metody mikroklimaticheskikh s'emok i raïonirovanie nebol"shikh territoriĭ.** [Methods of microclimatological surveys and the division of small territories.] (In: U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby, **Voprosy agrometeorologii,** ed. by F. F. Davitaia and M. S. Kulik. Moscow, **1958.** p. 76–81. 17 refs.)—The preliminary study of the microclimatic characteristics of a territory involves a visual climatic survey in order to evaluate the microclimatic characteristics of individual localities. The relative heights between different forms of relief, exposure of slopes, soil, plant cover, etc. are considered; quantitative indices of microclimatic features are obtained by studying the distribution of air and soil temperature, wind regime, radiational regime, etc. The climatic elements studied, the time of observation and program of work are determined by the purpose of the investigations. Thus the effect of shelter belts in steppe zones is studied in spring,

summer and fall; frost danger is studied by route surveys, etc. Best results are obtained by the simultaneous work of several observers one of whom carries out control observations at the most characteristic point of a territory. Microclimatic differences associated with daily variation of atmospheric temperature and humidity are studied by placing minimum and maximum thermometers at characteristic points either in special shelters or in simple booths; sometimes a partial network of self recording thermo-hygrographs is set up. The data, after being worked up, are entered on maps of various degrees of detail. The detailed mapping of the microclimatic elements and agroclimatic indices of a territory depends upon (1) the extent to which the element has been studied, (2) its variability in space, (3) density of the meteorological network, (4) presence of microclimatic observations and (5) appropriate hypsometric maps. Two methods are employed to take into account the spatial distribution of microclimatic features, namely: (1) appending to small scale map special tables indicating the amount of deviation of a given element for individual locations from the mean values shown on the map; and (2) preparing large scale maps (1:100,000, 1:25,000, and larger) of limited territories, such administrative districts, etc. In constructing large scale maps all physical geographic features of the given territory must be considered. A correct quantitative evaluation of microclimatic elements requires a complete knowledge of the element being mapped for the entire territory. Mapping is carried out on hypsometric maps showing contours of forests, marshes and cultivated areas. Maps of the scale of 1:25,000 or 1:10,000 show details of 20–50 hectares. *Subject Headings:* **1. Microclimatic studies 2. Climatic surveys.**—*I.L.D.*

11.8–307 551.584.1:551.571.1(439.1)

Andó, M. (*Climatological Inst. Szeged Univ.*), **Angaben zu den Luftfeuchtigkeitsverhältnissen des Mikroklimas im Algyőer Überschwemmungsgebiet der Theiss.** [Microclimatic atmospheric humidity data of the flood area of the Tisza River near Algyő.] *Acta Geographica*, Szeged, Hungary, 2(1/4):43–48, **1956.** 4 figs., 3 tables. **DLC**—At a number of microclimatic stations set up in the flood region of the Tisza between the village Algyő and a dry branch of the river, the author investigated the formation of atmospheric humidity, taking into consideration the interaction between the surface of the water and the flood area. With the aid of graphs and tables the author describes the nocturnal and diurnal formation of atmospheric humidity. These graphs illustrate the effect of wind upon dew formation, temperature differences before and after frontal passage and change in vapor pressures during fog formation. Tables give data on mean values of relative humidity during clear and overcast weather from 4 to 19 hrs. At night with calm weather and constant relative humidity of 95–100% the following phenomena occur in the flood area: dew; fog, which was observed in the morning hours of rainy days following a bright calm night; area haze, which could be observed regularly in the morning hours over the water as a result of cooling. During the day with alternating daily variation the following could be observed, viz: on a clear calm day the effect of the water prevailed so that the relative humidity decreased with distance; on a cloudy calm day after a rainy previous day the atmosphere above the vegetation and the humid ground of the flood area was more haze filled than over the water surface. During air movements in the flood area the differences equalized themselves to a great extent. *Subject Headings:* **1. Microclimatic data 2. Diurnal humidity variations 3. Algyő, Hungary.**—*I.L.D.*

11.8–308 551.584.4:633.2

Barnes, C. P. (*Agric. Res. Service, U. S. Dept. of Agric., Wash., D. C.*), **The climatic environment of grassland.** *American Association for the Advancement of Science, Wash., D. C., Publication*, No. 53:243–249, **1959. DWB** (M86:58 A512gr)—The distribution of the 4 great plant formations—grassland, desert, shrub, and tundra—reflects climate which makes its influence felt by favoring one formation over another. The margins of these are likely to be tension zones. Grassland stands greater extremes than forest as proved by the fact that natural grasslands remain in regions of climatic extremes. The position is contrary with regard to man-made grasslands because of moisture supply. Due to modern agricultural technology grassland can be established everywhere. Direct and indirect effects on grasslands are discussed in relation to particular situations. Climate is held to be one of the influences on grasslands. In some situations in all climatic regions grasslands are economically advantageous. Such situations can be found out by the study of the performance and production

costs of different grasses on soils of recorded characteristics and under kinds of climate whose characteristics are a matter of record. *Subject Heading:* **1. Grassland microclimatology.**—*I.S.*

11.8–309 551.584.41:551.577:551.575:551.578.46(433)

Baumgartner, Albert, **Das Wasserangebot aus Regen und Nebel sowie die Schneeverteilung in den Wäldern am Grossen Falkenstein (Bayer. Wald).** [Water yield from rain and fog as well as snow distribution in the forests of the Grosser Falkenstein, Bavarian Forest.] *Arbeitskreis "Wald und Wasser," Mitteilungen*, Coblenz, No. 3:45–54, **1959.** 6 figs., 5 tables, 13 refs. **DWB** (M:634.9 A664mi)—The landscape of the Grosser Falkenstein ($\varphi = 49°05'$, $\lambda = 13°17'$), in the Bavarian forest and the method of setting up the precipitation measuring instruments are described. The precipitation totals increased with altitude in some months and decreased with altitude in other months depending upon orography and weather situation. In comparison to the rain amounts on the entire area of the Bavarian forest the rain totals in the vegetation period May October on the Grosser Falkenstein were almost invariable with altitude and in part considerably less as was to be expected from the area average for the different altitude levels. The influence of the measuring procedures upon the rainfall distribution is analyzed and it is concluded that in measurements of rainfall amounts the collecting surfaces of the rain gages should be made parallel to the inclination of the slope on which the measurement is made. The measurement of fog and precipitation is discussed and data are presented on monthly fog frequency, monthly fog precipitation, and vertical distribution of percent fog precipitation (May–Oct. 1945 and 1955). The snow distribution is discussed with the aid of diagrams and its role in plant growth is considered. *Subject Headings:* **1. Forest microclimatology 2. Altitude effects on precipitation 3. Areal precipitation distribution 4. Grosser Falkenstein Mountain, Bavarian Forest.**—*I.L.D.*

11.8–310 551.584.5:551.510.42(436.2)

Weiss, Emmerich and Frenzel, Josef W., **Lokalklimatische und luftchemische Untersuchungen im Raume von Linz.** [Local climate and air chemistry investigations in the Linz region.] *Wetter und Leben*, Vienna, Sonderheft, No. 6:153–174, **1959.** 11 figs. (incl. photos), 16 tables, 5 refs. **DLC**—With the aid of considerable data presented in tables, graphs and isolines on maps the authors discuss various aspects of local climatology and atmospheric pollution in Linz and its immediate vicinity. The contents of this paper include the following, viz: cloud and haze in the area of Linz; temperature measurement route surveys in Linz; atmospheric chemical investigations in Linz; and dust investigations. An outline of the present program of the climatic research station of Linz is presented. *Subject Headings:* **1. Local climatic studies 2. Atmospheric pollution data 3. Urban climates 4. Linz, Austria.**—*I.L.D.*

11.8–311 551.584.5:551.510.42:551.594.12(794)

Beckett, J. C. (*Wesix Electric Heater Co., San Francisco*), **The influence of air pollution on the electrical properties of air.** (In: National Conference on Air Pollution, Wash., D. C., Nov. 1958, **Proceedings,** pub. **1959.** p. 114–115.) **DWB** (M10.42 N277pr)—In urban centers, for example San Francisco, air pollution has reduced the average small-ion density to less than 100 per cc of each polarity, about one-sixth the normal density; the number of larger ions (that is, charges on particulate matter) has increased. Continuous measurement for 8 years in San Francisco has revealed that the small ion density remains relatively low and relatively constant throughout the year. It is concluded that pollution of the urban atmosphere has markedly altered its electrical characteristics. This fact makes possible physical measurement for observing the degree of air pollution, particularly invisible or submicroscopic contamination. Perhaps of greater importance, the increasing evidence of the biological significance of air ions adds to the cumulating knowledge that air pollution is a serious hazard to human health. *Subject Headings:* **1. Atmospheric pollution effects on air electricity 2. Atmospheric electricity variations 3. Urban climates 4. San Francisco, Calif.**—*I.S.*

11.8–312 551.584.5:551.524:551.521.32(477)

Ziuzin, A. S., **Kharakter temperaturnogo polia v gorode i iavlenie anomal'noĭ bokovoĭ refraktsii.** [Characteristics of the temperature field in a city and anomalous lateral refraction.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 2:326–329, Feb. **1959.** 4 figs., table, 2 refs.,

eqs. **DLC**—With the aid of a diagram and relevant equations the author shows that f constant distance S and for small variations of the coefficient P/T^2 (where P = pressure a T = temperature) the lateral refraction depends chiefly upon magnitude of the horizon temperature gradient and the formula for the lateral angle of refraction is $\gamma'' = -10.84'' \frac{Sp}{T^2} \cdot \frac{d}{d}$ In order to determine the characteristics of the temperature field on the streets of a large ci in the immediate vicinity of large buildings and its effect on lateral refraction the auth measured in Dnepropetrovsk in 1954–55 horizontal angle and air temperature profiles. T presence of large refraction distortions of horizontal angles associated with a horizontal te perature field was demonstrated at a height of 1.5 m above the ground. On clear sunny da the observed magnitude of the horizontal angle, whose sides were continued for a distance 0.75 m from the line of the building to the side of the street illuminated by the sun, changed the course of the day owing to lateral refraction. These changes attained 20″ approaching toward morning and evening. Observations on the shaded side of the street or during clou weather, did not manifest perceptible systematic variations in the angles. The presence wind exceeding 3–4 m/sec destroyed the temperature field and refraction was scarcely p ceptible. Data are presented on variation of the horizontal angles in different meteorologi conditions for distances of vision from the line of the building at 0.75 m and for lengths of t sides of 175 m. *Subject Headings:* **1. Street microclimates 2. Temperature fields 3. R fraction anomalies 4. Dnepropetrovsk, Ukrainian S.S.R.**—*I.L.D.*

CLIMATIC CLASSIFICATION

See: **Precipitation, evapotranspiration and aridity, W. Pakistan** (Ahmad), 11.8–266; **Oklahoma Panhandle** (Doerr, Morris), 11.8–292.

BIOCLIMATOLOGY

See also: **Bioclimatological training of graduate students** (Sargent), 11.8–24; **Agrometeorological indices of maize growth** (Chirkov), 11.8–32; **Maize cultivation, Maritime Territory** (Kalmykova), 11.8–33; **Wheat yield and climate** (Mel'), 11.8–34; **Sunflower yield and climate** (Smirnova), 11.8–35; **Climate and citrus fruit** (Monselise, Turrell), 11.8–36; **Climate and coffee trees** (Alègre), 11.8–37; **Climate and coffee trees** (Kirov), 11.8–293.

11.8–313 551.586:551.515.8:57

Benkő, Sándor; Kiss, István and Csapó, Gábor, **Időjárás-élettani vizafalátok emberen növényi mikroszervezeteken.** [Biometeorological investigations on human beings and pla microorganisms.] *Időjárás*, Budapest, 62(6):332–338, Nov./Dec. **1958.** 2 figs., 12 re German summary p. 332. **DLC**—The number of eosinophile leucocytes in 12 patients (5 counts) and the propagation of aquatic micro-organisms (*Chlamydomonas reinhardi*) are co pared with atmospheric temperature, pressure, cloudiness, precipitation, wind and fron passage data. No effect of any of the meteorological elements was found but a correlation both eosinophile leucocytes and aquatic organisms with prefrontal weather situations appe to exist. It is suggested that some hitherto unidentified extraterrestrial factor may be sponsible for this correlation. *Subject Headings:* **1. Biometeorological studies 2. Fron effects on leucocytes 3. Frontal effects on microorganisms.**—*G.T.*

11.8–314 551.586:551.521.17:581

†*Brodführer, Ursula (*Munich Univ., Botanical Inst.*), **Der Einfluss einer abgestuft Dosierung von ultravioletter Sonnenstrahlung auf das Wachstum der Pflanzen.** [Influe of graduated doses of ultraviolet radiation on the growth of plants.] *Planta*, Berlin, 45:1– **1955.** 19 figs., 16 tables, bibliog. p. 54–56. **DLC, DWB** (M21.17 B864ei)—On the basis o comprehensive survey of the literature the author shows that the assumption that the acti of ultraviolet radiation is solely harmful is the result of an unpermissible transfer of resu obtained by radiation with a mercury arc lamp to conditions prevailing in nature especia at high altitude. The fundamental difference between the line spectrum of the lamp and t

continuous spectrum of the sun is stressed and it is pointed out that the spectral region of the lamps usually used in experiments contains much shorter wave lengths than the solar spectrum. The experiments carried out in open country at 1600 m above sea level involved three experimental beds with practically similar conditions but with different dosages of solar ultraviolet of spectral region 290–320μ. The experimental plants were *Epilobium parviflorum*, *Cumelina sativa*, *Arabidopsis thaliana*, *Linum usitatissimum*, *Leontodon autumnalis*, etc., among which were measured the length and thickness of the stem, the dry weight, number of leaves, blossoms, branching and time of blossoming. In addition the lengths of leaves of growing Leontodon rosettes, growing in the open country in which centers of the leaves were covered with glass of varying U-V transmissivity were measured. The following results were obtained: both different races and species react to U-V differently; the manner of reaction is not a specific characteristic. The individual organs of a plant do not behave uniformly. Only genetically similar individuals react uniformly when the same developmental sections undergo experimentation during the same period of an experimental summer. Depending upon dosage U-V radiation either retards or promotes growth. If a plant receives a smaller dosage than that needed at a given time for optimum development then its appearance resembles a poorly nourished plant; if it receives a large U-V dosage then it manifests an appearance of slower development. The reaction of a plant to U-V influence shows seasonal differences which manifest themselves both among annuals sown at different times and in the organ formation of perennials. If the early development of annuals or organ formation of perennials occurs in the spring then the effect of U-V is entirely one of retardation; if it is in the summer then it is either one of retardation or promotion depending upon dosage or sensitivity of the plant. There is probably a relationship between U-V effect and the growth substance metabolism of the plant. *Subject Headings:* **1. Ultraviolet radiation effects on plants 2. Biometeorology.** —*I.L.D.*

11.8–315 551.586:551.524

Seifert, G., **Das Klima der DDR—dargestellt durch Effektivtemperaturen.** [The climate of the German Democratic Republic represented by effective temperatures.] *Zeitschrift für Meteorologie*, Berlin, 12(11/12):328–338, Nov./Dec. **1958.** 11 figs., table, 9 refs. German summary p. 328. **DWB, DLC**—An attempt is made to describe the climate of the German Democratic Republic by means of the effective temperature. Effective temperatures corresponding to different dry and wet bulb temperatures and wind velocities were computed by the following formula of MISSENARD:

$$d_{eff}=37°-(37°-d_L)/(0.68-0.0014)\times RF+1/(1.76+1.4\times v^{0.75}(-0.29d_L\left(1-\frac{RF}{100}\right),$$

where d_{eff} = effective temperature, d_L = air temperature, v = wind velocity in m/sec, and by the Yaglou chart. The behavior of effective temperature in the individual meteorological regions of the German Democratic Republic is investigated on the basis of data of 11 synoptic stations for the months of June, July and August where the temperature exceeded 1°C for the year 1954, 1955 and 1956. The contents of the paper comprise the following, viz: the computation of the effective temperature diagram and the behavior of effective temperature waves for the same wind velocity but different dry bulb temperatures and relative humidities; the effective temperature mean for the station investigated; mean daily effective temperature during the summers of 1954–1957 at individual stations; effective temperature extremes; effective temperature and weather situations; effective temperature during incursion of Greenland polar air masses; effective temperature on summer days; effective temperature and cooling power in Dresden Wahnsdorf; and effective temperature in the comfort zone. The comfort character of the summer of the German Democratic Republic is evaluated. *Subject Headings:* **1. Effective temperatures 2. Comfort zones 3. Climate of East Germany 4. East Germany.**—*I.L.D.*

11.8–316 551.586:061.3(437)

Krečmer, Vladimír, **II. celoštátní bioklimatologická konference v Liblicích 1958.** [Second National Bioclimatological Conference in Liblice, 1958.] *Meteorologické Zprávy*, Prague, 12(2/3):63–65, **1959.** 4 photos. **DWB, DLC**—The second National Bioclimatological Con-

ference in Czechoslovakia was held at Liblice in Nov. 1958 with the participation of scientists from Czechoslovakia, the Soviet Union, Poland, Hungary, Romania, Bulgaria, East and West Germany and the Netherlands. Fifty-six papers were delivered in three sections: medical, agricultural and forestry. The opening lectures in each of these three fields are summarized and the resolutions are presented. Some of the participants are shown in photographs. *Subject Headings:* **1. Bioclimatology conferences 8. Liblice, Czechoslovakia.**—*G.T.*

11.8–317 551.586:581.5(98)

Andreev, V. N. and Vakhmina, T. V., **Vliianie prizemnogo klimata na fenologiiu rastenii v subarktike.** [The influence of the surface climate on the phenology of plants in the Subarctic.] *Priroda*, Moscow, No. 6:96–97, June **1959.** 2 figs. **DWB, DLC**—A number of peculiarities in tundra plants have been formed under the effect of the plants' adaptation to utilize the favorable conditions for their growth occurring at the earth's surface. Such are the diminutive size of the majority of Arctic plants and the development of special, if sprawled and trailing, vegetation. The height and the shape of Arctic plants indicate that the most favorable climate for the development of vegetation occurs between a height of 5–10 cm in the northern Subarctic and up to 20–25 cm in the southern part. *Subject Headings:* **1. Plant ecology 2. Climatic effects on plant life 3. Arctic plant life 4. Arctic.**—*A.M.P.*

ENVIRONMENTAL INFLUENCES

See: **Forest climatology, NW Senne area** (Hartmann), 11.8–38; **Forest effect upon evapotranspiration** (Lambor), 11.8–39; **Forest improvement, Schwarzer Regen region** (Klotz), 11.8–40; **Moisture exchange, forest zone of European U.S.S.R.** (Bashtan), 11.8–41; **Effect of smoke on illumination in a city** (Fedorov), 11.8–171; **Insolation in Carpathians and Sudetes** (Stenz, Slomka), 11.8–215; **Climate of Sofia metropolitan area** (Kirov), 11.8–293; **Measurement of atmospheric electricity on mountain tops** (Israël), 11.8–329.

MISCELLANEOUS

COSMIC INFLUENCES

11.8–318 551.590.21:523.746

Berg, Hellmut (*Cologne*), **Solar-terrestrische Beziehungen in der Biologie.** [Solar-terrestrial relationships in biology.] *Naturwissenschaftliche Rundschau*, Stuttgart, 12(5):170–175, May **1959.** 8 figs., 6 refs. **DWB, DLC**—The fallacy of superficial parallelism of solar-terrestrial and biological events is demonstrated. Although some relation of sunspots and biology may not be excluded entirely, caution should prevail against lighthearted generalization. Such false conclusions are shown on diagrams of sunspots in relationship to the number of immigrated jews to the U. S.; cerebrospinal meningitis; frequency of cholera in Russia, 1823–1923; small pox mortality in Chicago; egeomagnetism and embolism; annual rings of European beech trees; and various serum reactions. *Subject Headings:* **1. Solar-terrestrial relationships 2. Biological effects of sunspots.**—*O.T.* Ⓢ

11.8–319 551.590.22:551.521.16:593.14

†Korringa, P. (*Netherlands Inst. for Fishery Investigation, Ijmuiden, Netherlands*), **Lunar periodicity.** *Geological Society of America, Memoir*, No. 67:917–934, Dec. **1957.** 2 figs., plate, 44 refs. **DLC** (QH542.N3)—Periodicity of a number of forms of marine life is discussed thoroughly in this article. The diurnal and seasonal cycles, depending on temperature or light are taken for granted, but the lunar cycle which is so important for the Grunion or the Palolo worm, has been difficult to explain to the satisfaction of all concerned. The Grunion operates on a fortnightly basis, spawning on 3 or 4 nights after each new or full moon and only for 1 3 hrs just after high tide. Evidence indicates no connection with moonlight or sunset time, but a rhythmical maturation which parallels the tidal rhythm, bringing about a biological advantage since fertilization is thus enhanced. These rhythms are not disturbed by short term experiments. The Palolo worm swarms once a month at last quarter only and seems to be affected by length of darkness, not by tides. *Subject Headings:* **1. Lunar periodicity in zooplankton 2. Illumination effects 3. Length of darkness effects.**—*M.R.*

11.8–320 551.590.25:621.396.8

Montgomery, G. Franklin (*Natl. Bureau of Standards, Wash., D. C.*), **On the transmission error function for meteor-burst communication.** *Institute of Radio Engineers, Proceedings*, 46(7):1423 1424, July **1958.** fig., 3 foot-refs., 6 eqs. **DWB, DLC**—A graph shows threshold carrier to noise ratio r_t for $a=1.2$ for calculating fractional binary error for meteor burst communication using narrow band frequency modulation which depends also on meteor characteristics (a). *Subject Heading:* **1. Meteor burst communication.**—*M.R.*

OPTICAL PHENOMENA

See also: **Scintillation of stars** (Elsässer), 11.8-55; **Atmospheric scintillation** (Arsac), 11.8–56; **Polarization of light from sunspots** (Leroy), 11.8–62.

11.8–321 551.593.63(99)

Mitin, P. F., **Interesnoe opticheskoe iavlenie v Antarktide.** [An interesting optical phenomenon in the Antarctic.] *Meteorologiia i Gidrologiia*, Leningrad, No. 3:39 40, March **1959. DWB, DLC**—On Dec. 14, 1958, in Antarctica the southern magnetic pole was situated at station Vostok. At 0730 (Moscow time) a halo appeared around the sun at an angle of 22°. At 0810 on the circumference of the halo two sun dogs, through which passed two arcs, formed an external ellipse around the halo. A belt extending over the entire sky and intersecting both sun dogs then formed. At 0830 a second halo appeared at 46°, while the upper semicircle was visible almost completely and the lower only in two individual places. At that time the belt was visible only partly, near the halo. In 5 min. the circle under the 46° angle ceased to be visible but the internal angle (22°) with the sun dogs and the ellipse persisted. The belt appeared and disappeared several times from 0845 to 0906. At 0915 halo and ellipse began to disappear but the sun dogs were still visible for 15 min. At that time the sky was covered with thin translucent cirro-stratus clouds. Underneath them at 800–1000 m scattered stratus clouds moved from south to north. The air temperature was −30.8°C and relative humidity 70%. Ice crystals fell from the cirrus clouds. The belt is explained by the scattered clouds and by the characteristic shape of the crystals which were star shaped with 3 to 8 rays and not resembling snow flakes at moderate latitudes. The halo phenomenon with several sun dogs (up to six) is characteristic of Central Antarctica. *Subject Headings:* **1. Halos 2. Parhelia 3. Antarctic.**—*I.L.D.*

11.8–322 551.593.1:551.521.32:016

†Harker, George S. (*U. S. Army Medical Res. Lab., Fort Knox, Kentucky*), **Whiteout: a bibliographical survey.** *American Meteorological Society, Bulletin*, 40(5):225–229, May **1959.** 51 refs. **DWB, DLC**—The polar phenomenon of whiteout is described through the medium of quotations from persons who have experienced the phenomenon. The meteorological conditions indicated to produce the phenomenon are noted and the mechanism of their operation discussed in terms of research findings available in the literature. Topics considered are: diffuse illumination, meteorological range, and illumination levels. Contributory physiological factors are noted and discussed under the following headings: retinal illumination, empty-field myopia, and entoptic phenomena. The psychological import of whiteout is discussed in relation to perception of the vertical, directional orientation, and distance estimation. *Subject Headings:* **1. Polar whiteout bibliographies 2. Optical phenomena 3. Bibliography on whiteout.**—*Author's abstract.*

11.8–323 551.593.5:551.574.1

Morozov, V. M., **O nemolekuliarnom rasseianii sveta v vysokikh sloiakh atmosfery.** [Non-molecular scattering of light in high atmospheric layers.] *Akademiia Nauk SSSR, Doklady*, 113(5):1039–1042, **1957.** 4 figs., table, 9 refs. **DLC**—Deals with the investigation of light scattering by means of searchlights. An improved mathematical method considering the distribution of the projected light is presented, and the results of a few actual soundings up to a height of 40 km are shown in comparison with the theoretical Rayleigh scatter. Non-molecular scatter by aerosol is evident up to a height of 30 km, or possibly 40 km. *Subject Headings:* **1. Light scattering 2. Searchlight technique 3. Moscow District, U.S.S.R.**—*A.A.*

11.8–324 551.593.55:535.243

Darchiia, A. Kh., **Spektrofotometriia zari.** [Spectrophotometry of twilight.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 5:788–795, **1959.** 6 figs., 2 tables, 10 refs., 3 eqs. **DWB, DLC**—On the basis of spectrophotometric observations the author attempts to determine the atmospheric layers (at what height above the surface of the earth and at what distance from the observer) that participate in the twilight phenomenon and to provide data for constructing a theory. The spectrophotometric technique is described. Observations were made at three localities differing sharply both in geographic position and climatic characteristics, namely in the Batum district, in the Aktiubinsk district, and in the vicinity of Alma-Ata. Visual estimates of types of twilight need not be considered subjective; they agree well with types of spectral curves differing in brightness in the short wave and long wave parts of the spectrum. The latter are associated with the dimensions and nature of aerosol particles in the atmosphere. The spectrum type of twilight is independent of the latitude of a place and of the underlying surface in the direction of observation. An air mass that is homogeneous in a horizontal and vertical extension produces a twilight having a constant spectrum type and a monotypic decrease in brightness with increase of $z_{\odot}$. Cases of variation of the spectrum type of twilight marked by a premature extinction and sudden diminution of brightness with increase of $z_{\odot}$ are produced by inhomogeneity of an air mass. The variation of the spectrum characteristics of twilight in the absence of which there would not be any variation in the visible sphere indicates that the layers of the atmosphere (cloud forming up to heights of 3–5 km) beyond the horizon of the observer up to a distance of about 600 km participate in the twilight phenomenon. *Subject Headings:* **1. Twilight phenomena 2. Spectrophotometric observations.**—*Based on author's conclusions & I.L.D.*

11.8–325 551.593.55:535.33

Khvostikov, I. A. and Megrelishvili, T. G. (*both, Abastumani Astrophysical Obs., Mt Kanobili, Georgian S.S.R.*), **New bands and lines in the twilight sky spectrum.** *Nature*, London, 183(4664):811, March 21, **1959.** fig., table, 4 refs., eqs. **DWB**—The observations briefly reported on began in 1957 at the Abastumani Astrophysical Observatory by means of a spectrograph with grating 135×90 mm², 1.200 lines/mm, camera $f=70$ mm, dispersion 80 A/mm in the red region. Tabulated interpretation of the new bands observed to appear permanently or episodically is given along with facsimile reproduction. *Subject Heading:* **1. Twilight spectra.**—*W.N.* ⑤

11.8–326 551.593.61

Kupetskiĭ, V. N., **O krugloĭ raduge.** [On the circular rainbow.] *Priroda*, Moscow, 7:127, July **1959.** 2 refs. **DLC**—A letter to the editor of the journal referring to a note entitled **Observation of a rainbow from an airplane** by P. N. Kulikovskiĭ (No. 11, **1958**). The author explains that the observed circular rainbow is a well known optical atmospheric phenomenon called "glory" or "brocken bow" which is often observed by flyers and hydrological observers during ice reconnaissance flights. The author adds that in spite of seeming simplicity of the phenomenon no accurate theoretical explanation of "glory" has been yet developed. *Subject Heading:* **1. Glories.**—*A.M.P.*

ELECTRICAL PHENOMENA

See also: **Effects of radioactivity on atmospheric electricity** (Israël), 11.8–45; **Auroral ionization** (Nichols), 11.8–96; **Air pollution and atmospheric electricity** (Beckett), 11.8–311.

11.8–327 551.594

Israël, Hans, **Luftelektrische Probleme.** [Atmospheric electricity problems.] (In Israël, Hans, ed., **Luftelektrizität im A. G. J. Bericht über die Tagung in Aachen am 11.–12. Mai 1956.** pub. Aachen, **1957.** p. 9–12. German and English summaries only. ref.) **DWB**—Author considers the electrical balance of the atmosphere, development of methods for separation of global and local components of atmospheric electrical processes, and a direct measure for thunderstorm activities in the individual world storm centers. The causal relation

between global and more or less local activities is illustrated by the case of sferics direction finding in general and results obtained in Zurich in particular. Other related subjects discussed are radioactivity, aerology etc., for which combined or coordinated studies are suggested. *Subject Heading:* **1. Atmospheric electricity.**—*W.N.*

11.8–328 551.594.11/.13:551.510.53

Lugeon, Jean, **Valeur moyenne approximative du gradient de potentiel et de la conductibilité électrique dans la haute atmosphère de Payerne.** [Mean approximate value of the potential gradient and of electrical conductivity in the upper atmosphere at Payerne.] *Schweizerische Naturforschende Gesellschaft, Geneva, Verhandlungen,* 138:107–109, **1958.** table, 3 footrefs. **DLC** (Q67.S4)—The results of 163 radio soundings, from July 1957 to August 1958, are presented in a table. It shows that the conductivity starts to decrease at about 18 km altitude, perhaps in relation to the ozone layer. The decrease is of high regularity, except in the lower layers of the troposphere where strong variations are produced by lability of the air, convection, and precipitation. The simultaneous radio soundings at Murchison Bay and at Payerne during the International Geophysical Year, when evaluated after the return of the Swiss expedition in 1958, may result in obtaining the parameter of global conductivity. *Subject Headings:* **1. Potential gradient vertical distribution 2. Atmospheric conductivity 3. Upper air electricity 4. Payerne, Switzerland.**—*O.T.*

11.8–329 551.594.11:551.43

Israël, H., **Gebirgsmessungen.** [Measurements in mountains.] (In: Israël, H., ed., **Luftelektrizität im A. G. J.: Bericht über die Tagung in Aachen am 11.–12. Mai 1956.** pub. Aachen, **1957.** p. 91–99. 13 refs. English summary p. 91–92.) **DWB** (M94 I851u)—Measurements of atmospheric electricity on mountain tops are handicapped by the orographically disturbed environment, but this is compensated by the fact that they allow continuous recording and thus make it possible to record variations in time. Problems concerning the reduction of the measurements and the separation of local and global influences in such measurements are discussed. The best system of reduction appears to be to compare the measurements with those made at the same height in the free atmosphere. A comparison of diurnal variations of the potential gradient at a series of high mountain stations leads to the conclusion that the variations in the Pacific area show a different pattern from those in the European area. This may be explained by a superposition of two curves, one given by the variations of global thunderstorm activity, the other by variations of the local influence of austausch. *Subject Headings:* **1. Diurnal potential gradient variations 2. Mountain meteorological stations.**—*Author's abstract.*

11.8–330 551.594.13:551.510.534

Lugeon, Jean (*MZA, Zurich*), **Mesures de la conductibilité électrique de l'air dans la couche d'ozone.** [Measurements of the electric conductivity of the air in the ozone layer.] *Schweizerische Naturforschende Gesellschaft, Geneva, Verhandlungen,* 137:71–72, **1957. DLC** (Q67.S4)—The results of the simultaneous measurements at Payerne and at Murchison Bay during the International Geophysical Year are briefly presented. They showed almost the same numerical values. The diagrams, however, show a new phenomenon: a starting inversion at about 20 km was found, reaching a maximum at 23 km, then diminishing till reaching a linear value at 30 km, almost in each flight. The increase of conductivity coincides possibly with the center of density of the ozone layer but is not imputable to the single recombination of ions by an action of radiation. It is suggested that the electric conductivity of the ozone layer varies according to the vertical distribution of its molecules. *Subject Headings:* **1. Electrical conductivity of air 2. Ozone layer electricity.**—*O.T.*

11.8–331 551.594.221:551.501.83

Norinder, Harald and Knudsen, Edgar (*both, Univ. Uppsala, Sweden*), **The relation between lightning discharges and whistlers.** *Planetary and Space Science,* N. Y., 1(3):173–183, Aug. **1959.** 10 figs., 3 tables, 10 refs. **DWB**—A station for analysis of relations between lightning discharges and whistlers was operated near Uppsala. After preliminary tests in 1956–57 a definite program was carried out during the thunderstorm season of 1958. It was

found that whistlers occur in groups—whistler situations—with periods often of ½–2½ hr, exceptionally of 5–6 hr. Whistlers sometimes occurred in great numbers for shorter periods of time between total cessations. These extended over hours, days and even weeks. Whistler situations on days with thunderstorms were located by a c.r.o. direction finder. It was found that whilst a thunderstorm in one direction produced whistlers, a simultaneous thunderstorm in another direction at about the same distance sometimes did not. Investigation of variations in the same thunderstorm of the electric field force from atmospherics related to whistlers or not so related showed that atmospherics with the highest field force were always followed by whistlers. This was explained partially by facilitated propagation for wave-packets in the low-frequency band around 5 kc/s and partially by high initial energy in the discharges causing whistlers. A comparison in the same thunderstorm of waveforms from atmospherics not producing whistlers showed typically irregular variational forms and one single discharge in the lightning path. Waveforms of whistler-producing atmospherics showed regular variational forms with frequencies around 5 kc/s. In several cases the waveforms indicated multiple discharges in the lightning path. *Subject Headings:* **1. Lightning discharge-whistler relationships 2. Whistler analysis 3. Sferics wave forms.**—*Authors' abstract.*

11.8–332 551.594.223

Křivský, L., **Záře po blescích u vzdálené vouřky.** [Glow following lightning strokes during a distant thunderstorm.] *Meteorologické Zprávy*, Prague, 11(6):167–168, **1958. DWB, DLC**—On several occasions, while observing a distant thunderstorm (about 15 km) the author noted lightning strokes followed by a strong light from the ground which had a constant intensity and no specific structure. The duration of such lights was 1–4 sec, in one instance about 4 sec, and they ended abruptly. Such lights followed one out of 10 lightning strokes. A possible source of the observed light would be ball lightning. If this hypothesis could be confirmed, the observation of distant thunderstorms could serve to determine frequencies of the formation of ball lightning. *Subject Headings:* **1. Lightning strokes 2. Ball lightning.**—*G.T.*

AURORAS

See: **Sec. D2,** p. 1231.

ACOUSTICAL PHENOMENA

11.8–333 551.596.1 532.59:534.2

Brekhovskikh, L. M., **Poverkhnostnye volny v akustike: obzor.** [Surface waves in acoustics: a review.] *Akusticheskiĭ Zhurnal*, Moscow, 5(1):4–13, **1959.** 7 figs., 4 refs., 41 eqs. **DLC.** Transl. into English in *Soviet Physics: Acoustics*, N. Y., 5(1):3–12, Jan./March **1959.** figs., etc. **DLC**—An analytical treatment is presented of the propagation of a plane wave along a comblike surface, including problems connected with the excitation of such a surface wave, and of the radiation of spherical waves from a cylinder representing a simplified form of the comblike rods along which the surface wave propagates. *Subject Headings:* **1. Surface waves 2. Acoustical propagation.**—*G.T.*

11.8–334 532.59:551.596.1

Sâto, Y. (*Univ. of Tokyo, Japan*), **Classification of surface waves and related topics.** *Journal of Geophysical Research*, Wash., D. C., 63(3):635–636, Sept. **1958.** Note: Contribution No. 885, Division of the Geological Sciences, Calif. Inst. of Technology, Pasadena, Calif. **DLC**—The various types of surface waves can be classified according to whether the amplitude of the surface wave decays exponentially or sinusoidally with distance in the direction perpendicular to the boundary surface. The wave equations which describe SH waves in a perfectly elastic solid and acoustic waves in an ideal fluid are identical in form. *Subject Headings:* **1. Surface waves 2. Acoustical propagation.**—*N.N.*

PART II. RECENT LITERATURE ON RADAR METEOROLOGY

Compiled by: Andrew J. Meglis and Robert Panara

INTRODUCTION

Three bibliographies on **Radar Meteorology** have been previously published in *Meteorological Abstracts and Bibliography* [2(8):680–711, Aug. 1951; 6(7):997–1050, July 1955 and 9(8):1005–1030, Aug. 1958]. In the last two years since the publication of the third bibliography, we have continued to include literature on radar meteorology in our current abstracts, but due to space limitations, more and more material accumulated in our files. This material is now presented to the reader in order to bring our coverage of this important field up to date. To facilitate use of the over 150 items, a subject outline has been prepared in which reference is also made (in parentheses) to abstracts published in *Met. Abstracts* since the last bibliography on radar meteorology.

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11H–1 551.508.85:551.576.21

Aoyagi, J. (*Met. Res. Inst., Tokyo*), **A radar rainfall contouring device.** *Papers in Meteorology and Geophysics,* Tokyo, 9(3/4):152–162, Jan. **1959.** 6 figs. (incl. photos), table, 8 refs., 7 eqs. Japanese summary p. 162. **DWB**—This paper describes a device that indicates rainfall contour lines on radar scopes. For this purpose a range correcting signal r, a signal $K_1 r$ correcting atmospheric gases attenuation, a signal $K_2 R^{\alpha} dr$ correcting for attenuation by intervening rain and predetermined B, β signals which show the raindrop characteristics, are compensated for the input signal Pr which is reflected from the rainfall. After the resultant signals are selected by a predetermined level which corresponds to a certain rainfall the selected signals are presented on the PPI or the RH1 scope as rainfall contours. It is convenient to use Pr, r and B in the logarithmic unit for the circuit construction and the rainfall measurements will range over 60 dB. A mechanism which carries out level selections is added to this device. As the mechanism is constructed so as to synchronize with the radar antenna rotation, the iso patterns are automatically photographed by a 35 mm camera. It is also possible to skip certain levels freely for effective photographing. Comparisons between rain gages and this device show pretty good agreement, by correcting for the attenuation by intervening rain. But the attenuation will be one of the very important causes of the errors in case we use a 3.2 cm wavelength radar. *Subject Headings:* **1. Radar rainfall measurement techniques 2. Contour radars.**—*Author's abstract.*

11H–2 551.501.81:551.594.221:551.594.6

†Atlas, David (*GRD, A. F. Camb. Res. Ctr., Bedford, Mass.*), **Radar lightning echoes and atmospherics in vertical cross section.** *Conference on Atmospheric Electricity, 2nd, Portsmouth, N. H., May 1958, Proceedings,* issued **1958.** p. 441–458. 6 figs., 3 tables, 20 refs., 2 eqs. **DWB** (M(055) C748 pr)—Lightning echoes and sferics have been recorded at the tops of an intense isolated thunderstorm viewed in vertical cross section by 10 cm radar. The echoes are usually

vertically oriented, up to 27,000 ft tall and have apparent horizontal diameters up to 30,000 ft at their bases, frequently corresponding to the diameter of the precipitation echoes from which they extend. Average echo depths range from 5400 ft to 12,400 ft in approximate inverse proportion to the discharge rates of 3.8 and 2/min. An occasional stroke is recorded, even during the period of rapid decay of the storm. A detection probability of about 42% is indicated for the 20/min rate of viewing employed; all discharges might have been recorded, using the maximum available viewing rate of 60/min. The high detection probability indicates persistence of ionization for about 0.5 sec. Electron densities of 10^6 to $10^9/cm^3$, considerably below that for critical reflection, are estimated from echo intensities and column dimensions, and are consistent with required recombination times and total charge transfer. Probably the associated discharges are neither visible nor audible. The strongest and most frequent sferics, having structure suggestive of stepped-leaders, emanate from the ice crystal region above the intense precipitation echo. Ionization then appears to propagate upward to account for the lightning echoes. This suggests a discharge process from the usually positive ice crystal region which is initiated by stepped-leaders and followed by a slow neutralization accord with that proposed by MALAN and SCHONLAND for the F-type field change. The stronger sferics from the storm top have intensities corresponding to that expected from the stepped-bands as to make such systems useful for sferic detection within line of sight. A micro-analysis of the radar storm structure and detailed ground reports under the storm show the regions of intense electrification with respect to intense rain and hail. *Subject Headings:* **1. Radar echoes from lightning 2. Radar echoes from sferics.**—*Author's abstract.*

11H–3 551.510.81:551.510.62:621.396.11

Atlas, David (*GRD, AF Camb. Res. Ctr.*), **Sub-horizon radar echoes by scatter propagation.** *Journal of Geophysical Research*, Wash., D. C., 64(9):1205–1218, Sept. **1959.** 8 figs., 3 tables, 13 refs., 8 eqs. **DLC**—The paper deals with a unique 3-cm radar observation in which echoes arranged in cellular and striated patterns were detected out to a maximum range of 90 mi. The cellular structure closely resembles a Bénard convection pattern and the cell scale is consistent with that to be expected when convection is restricted to a layer of the observed depth. The echoes cannot be attributed to clouds or precipitation, which were absent. Birds, insects, or other particulate matter are also illogical targets. Direct back scatter or angel echoes from atmospheric inhomogeneities are also precluded except at very short ranges, because of the restricted echo heights and great ranges. The echoes can only be attributed to a mechanism of forward scatter by atmospheric eddies to ground targets, and back, via the same path. The resulting echo structure is then that of the convectively patterned atmospheric "mirror" upon which are superimposed the more prominent features of the topography. Theoretical analysis indicates that the magnitude of the forward-scatter intensity function must be extremely high. However, extrapolation of the frequencies with which smaller scatter intensities have been observed indicates that the required magnitude might be expected to occur with a frequency which is in general accord with the rarity of the present phenomenon. Although the required index irregularities are extremely sharp, they are physically conceivable. *Subject Headings:* **1. Radar echoes by scatter propagation 2. Radio wave scattering.**—*Author's abstract.*

11H–4 551.501.81:551.510.62

†Atlas, David (*GRD, AF Camb. Res. Ctr.*), **Possible key to the dilemma of meteorological "angel" echoes.** *Journal of Meteorology*, Boston, 17(2):95–103, April **1960.** 3 figs., 2 tables, 22 refs., 26 eqs. **DWB, DLC**—The theory of the back-scatter from invisible atmospheric targets which are considered to be likely sources of "angel" echoes is reviewed. Special attention is given to planes and bubbles and vapor sheaths of large radius of curvature with cross sections which cannot be obtained from the conventional far-zone radar theory. The cross sections of such surfaces approximate reported "angel" cross sections if the surface reflection coefficient and corresponding refractive index gradient is large but not inconceivable. The segments of these surfaces need only be approximately as large as the first Fresnel zone in order to behave essentially like the entire surface. In the microwave band, the required sizes are of the order of a few meters at short ranges. Partial focusing by surfaces concave toward the radar may enhance the cross sections further. However, surface roughness may reduce the cross sections significantly. While it may be difficult to visualize essentially smooth atmospheric surfaces as large as 5 to 10 m, the alternative solution, which assumes bubbles or eddies of small radius of curvature, requires extremely large and questionable refractive index gradients. Although the question is left open for future validation, the author believes, on the basis of limited observations, that the first alternative is the more likely one. This is indicated in several important cases of "angel" activity. *Subject Heading:* **1. Radar angels.**—*Author's abstract.*

11H–5 551.501.81:551.578.1:551.515.4

Austin, Pauline M. (*M. I. T.*), **Radar observations of storm structure on the micrometeorological scale.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. J:14–20. 4 figs., table, 7 refs. **DWB** (M01.81 R124pc, 1958)—Photographs of range-

corrected radar signal intensity contours make it possible to observe the smaller-scale storm structure within the precipitation areas which appear on a normal PPI presentation. The dimensions, motion, duration and intensity of the small showers are compared with the characteristics of the settings provide information on the vertical structure. Three storms associated with cold fronts, several squall lines and some coastal storms have been analyzed. The general characteristics of each type of storm and the similarities and differences between them are pointed out. In some of the storms the microscale variability is pronounced and clearly should receive consideration in investigations regarding the formation of precipitation and the effects of the precipitation process on the surrounding atmosphere. *Subject Headings:* **1. Radar observation of storm structure 2. Radar analysis of showers.**—*Author's abstract.*

11H–6 551.501.81:551.510.721

Austin, Pauline M., **Application of weather radar to fallout prediction.** Massachusetts Institute of Technology. Dept. of Meteorology. Weather Radar Research, Contract DA-36-039 SC-75030, Quarterly Technical Report, No. 5, June **1959.** 13 p. 2 figs., tables. **DWB** (M01.81 M414rge)—Measurements of the transmitted power, beam pattern and antenna gain for the SCR-615-B and AN/CPS-9 radars have been completed. The values obtained for the SCR-615-B are in excellent agreement with previous calibrations. The measured value of antenna gain for the AN/CPS-9 was somewhat higher than that indicated by other measurements. The major instrumentations work is the construction of a unit for obtaining integrated echo intensity contours on the AN/CPS-9 radar. The logarithmic IF strip and a suitable quartz delay line have been obtained. Progress on the building of the instrument is very good. In analytical work detailed analysis of storm structure is continuing. At the present time emphasis is on warm frontal rain and summertime squall lines. A detailed study of the effect a particular storm might have on the distribution of fallout from a nuclear detonation is underway. Results from this study will not be available until the coming quarter. *Subject Headings:* **1. Weather radar in fallout prediction 2. Radioactive fallout pattern forecasting.**—*Author's abstract.*

11H–7 551.501.81:551.510.721

Austin, Pauline M., **Application of weather radar to fallout prediction.** Massachusetts Institute of Technology, Dept. of Meteorology. Weather Radar Research, Contract DA-36-039 SC-75030, Quarterly Technical Report, No. 6, June 1–Aug. 31, 1959, issued Sept. 15, **1959.** 13 p. fig. **DWB** (M01.81 M414rge)—In the construction of new instrumentation two projects are under way, the equipment for providing signal intensity contours with the AN/CPS-9 radar, and the instrumentation for obtaining accurate R-meter measurements simultaneously at two places. Both projects are nearly complete and should be providing data during the coming quarter. A preliminary study of the manner in which the storm of Nov. 8–9, 1957 might have modified the fallout pattern for a 10 KT detonation has been completed and some of the results are presented. A similar study is being made for a storm where air mass thunderstorms occurred and it is planned to include a squall line or cold front band also. Attempts will be made to make general deductions from these particular cases. Consideration is also being given to the problem of higher-yield detonations. Studies concerning the small-scale structure of storms and the spectra of turbulence in the atmosphere are being continued. *Subject Headings:* **1. Radioactive fallout pattern forecasting 2. Weather radar in fallout prediction.**—*Author's abstract.*

11H–8 551.501.81:551.577.37

Austin, Pauline M. and Berry, Dorothy G. (*both, Wea. Radar Res., M. I. T.*), **Note on the duration and dimensions of showers of different intensities.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. J:21–29. 4 figs., 3 tables, 3 refs. **DWB** (M01.81 R124 pc, 1958)—Records from two modified Hudson-Jardi rain gages have been analyzed to find the distribution of the durations, at a given point, of periods when the precipitation exceeded selected rainfall intensities. About 450 hrs of rain occurring in over 70 storms have been analyzed; the results are presented in histograms. Radar data in the form of range-corrected signal intensity contours have been analyzed to find the size distribution of precipitation areas where the rain exceeded various rainfall intensities. Some information regarding the lifetimes of showers of different intensities is included. Data are presented separately for various synoptic types and for storms where the maximum rain intensity differed significantly. *Subject Headings:* **1. Radar precipitation intensity measurement techniques 2. Rainfall duration.**—*Authors' abstract.*

11H–9 551.501.89:551.557

Barbé, G. D. (*France. Météorologie Nationale*), **Estimation pratique des erreurs commises dans la mesure du vent en altitude avec un radar à poursuite automatique en utilisant la méthode des sondages rapprochés dans le temps.** [Practical estimation of errors in measuring winds aloft with automatic tracking radar using the method of frequent soundings.] *Meteorological Society of*

Japan, Tokyo, 75th Anniversary Vol. of the Journal, pub. Nov. **1957.** p. 383–398. 15 figs., eqs **DWB, DLC**—The aerological station of Trappes (France) made more than 700 soundings betwee Oct. 15, 1956 and May 15, 1957 by means of a French automatic tracking radar "Thomson-Houston Cotal" on the 10 cm wave length. The precision was generally higher than 50 m for measuring th oblique distance radar-balloon and higher than 2/1000 radian for measuring the angles of elevatio and azimuth. The period between 2 soundings generally varied between 1 and $1\frac{1}{2}$ hr. By thes soundings, the practical estimation of errors made in measuring winds aloft is possible. Moreover they reveal the degree of stability of the atmospheric circulation aloft (from 2 or 3 km above soi level); atmospheric turbidity plays only a small part. The soundings make possible the study of th essential characters of the jet stream evolution during its growth period. The maximum and mini mum altitudes of the curve $Vt=f(z)$, (Vt = transversal or tangential wind), determine the levels wher the curve of the atmospheric circulation changes. At increasing height, and between a minimum an maximum of the curve $Vt=f(z)$, the circulation is anticyclonic; it is cyclonic when passing from maximum to a minimum. The complete change from an anticyclonic wind regime to a cycloni regime or vice versa occurs in thin layers and happens in one minute. The fine lamellar structur of the atmosphere and the permanence or progressive development of this fine lamellar structur during a period of several hours are also studied. *Subject Headings:* **1. Upper air wind studie 2. Radar wind observations 3. Stability of the upper atmosphere 4. Upper air circulation.**—*A.V*

11H–10 551.508.85:551.501.81(541

Basu, S. (*Director-General of Obs., India*), **A brief note on the weather radar studies undertake in the India Meteorological department.** *Weather Radar Conference, 6th, Cambridge, Mass., Marc 26–28, 1957, Proceedings*, pub. **1957.** p. 363–364. **DWB** (M01.81 R124pc)—Low power storm detection radar sets are in operation at New Delhi and Poona, and a long range set at Calcutta Equipment is described and their present and future use outlined. Studies of cloud and squal structure during thunderstorms, cyclonic and monsoon storms and for studies of conditions o super-refraction. *Subject Headings:* **1. Weather radar installations 2. Radar equipment 3. India** —*M.R.*

11H–11 551.501.81:551.509.61

Battan, Louis J. and Kassander, A. R. (*both, Univ. of Arizona*), **Evaluation of a cumulus clou seeding experiment through the use of radar data.** *Weather Radar Conference, 7th, Miami Beach Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. A:24–29. 3 figs., 2 tables, 3 refs. **DWI** (M01.81 R124pc, 1958)—Radar observations obtained with a 3-cm vertically-scanning radar sc have been used to evaluate a randomized cloud seeding experiment. The data strongly sugges that the clouds were modified by silver iodide seeding. *Subject Headings:* **1. Cloud seeding evaluatio 2. Radar observation of cloud seeding.**—*Authors' abstract.*

11H–12 551.501.81:551.515.

Beckwith, W. Boynton (*United Air Lines, Met. Dept.*), **Shower and thunderstorm echo pattern in Eastern Colorado.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958 Proceedings*, issued **1958.** Sec. J:1–7. 6 figs., 7 refs. **DWB** (M01.81 R124 pc, 1958)—An ap proach to a radar climatology of the summer precipitation patterns of the high plains of easter Colorado is made from the hourly radar plots of echoes during two summers. By charting the scop presentations from a ground-based AVQ-10 radar on grids 15 mi square, areal frequencies are de termined. A comparison between these occurrences and the data recorded from a few offici reporting stations in the area is made. The effect of range out to 150 mi from the radar site evaluated in terms of thunderstorm intensity. Echo patterns have also been studied for favore regions of squall line developments. *Subject Headings:* **1. Radar echoes from thunderstorm 2. Eastern Colorado.**—*Author's abstract.*

11H–13 551.501.81:551.507.352:551.55

Bessette, Michel and Lebleu, René, **Le radar Doppler et ses applications.** [Doppler radar an its applications.] *France. Secrétariat Général à l'Aviation Civile et Commerciale, Bulletin de Liaiso et de Documentation*, No. 95:27–34, March 15, **1958. DLC**—Description, functioning and mai features of the essential parts of Doppler radar designed for airplanes. The instantaneous knowledg of the ground-speed and of the drift helps determine, either manually or automatically, the win direction and force encountered on the air route. *Subject Headings:* **1. Doppler radar 2. Rada wind measurement techniques 3. Wind measurement from aircraft.**—*A.V.*

11H–14 551.501.81:551.515.

Bigler, Stuart G. (*Dept. of Oceanog. & Met., Texas A & M College*), **Observations of a tornad using the AN/CPS-9 radar.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 195 Proceedings*, issued **1958.** Sec. K:1–5. 3 figs., 8 refs. **DWB** (M01.81 R124pc, 1958)—PPI an

RHI photographs of a tornado are described and compared with previous observations. The tornado cyclone was clearly evident and extended to an altitude of 36,000 ft, which is comparable to other observations. *Subject Heading:* **1. Radar observation of tornadoes.**—*Author's abstract.*

11H–15 551.501.81:551.510.62

Bigler, Stuart G., **Some non-precipitation radar echoes as observed by CPS-9 radar.** Texas. A. and M. College. Dept. of Oceanography and Meteorology, Contract AF 19(604)-3864, Scientific Report, No. 1, Sept. **1959.** 27 p. 15 figs., table, 15 refs. **DWB.** Also his: **On the observation and application of angel echoes using the AN/CPS-9 radar.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings,* issued **1958.** Sec. D:22–30. 8 figs., 8 refs. **DWB** (M01.81 R124pc, 1958)—Echoes from regions in the atmosphere where no reflecting or scattering sources could be seen are described. Such echoes, commonly called angels, include the following types, (1) thin lines associated with wind shifts in dry fronts, and preceding squall lines and air-mass showers, (2) echoes arranged in layers aloft, (3) others which are uniform and diffuse, (4) fibrilliform echoes presumably resulting from thermals, and (5) mantle echoes which correspond to the outer boundaries of cumulus clouds. One or more of these echo types were photographed on 79% of the 37 radar operating days between June 1 and July 23, 1958. Meteorological conditions during the observations are described. First gust lines associated with scattered showers and thunderstorms are considered in some detail. Illustrations of the PPI and RHI presentations of these lines as well as wind, pressure, and temperature records are included. It is concluded that these thin lines are the boundary of mesosystems and provide another method for study of the characteristics of mesosystems. *Subject Headings:* **1. Radar angels 2. Radar photographs.**—*Author's abstract.*

11H–16 551.501.81:551.515.3:001.1

Bigler, Stuart G. and Inman, Rex L., **A preliminary classification of radar precipitation echo patterns associated with midwestern tornadoes.** Texas. Agricultural and Mechanical College. Dept. of Oceanography and Meteorology, Contract Cwb-9322, Final Report, Pt. A, Sept. **1958.** 20 p. 11 figs., 2 tables, 4 refs. **DWB** (M01.8 T355re)—A survey of midwestern severe storm situations, as observed by several ADC radars, has been made in an effort to reveal the distribution of radar precipitation echoes, with which tornadoes are associated. These storms are grouped according to their appearance on time-lapse PPI scope photographs into several types including isolated and scattered echoes, wide spread sheet echoes, and several catagories of line echoes. Characteristic features of each of these types are described and examples are discussed. *Subject Headings:* **1. Radar precipitation echoes classification 2. Radar tornado photographs 3. United States.**—*Authors' abstract.*

11H–17 551.508.85

Begun, A. A., **Vertikal'noe i gorizontal'noe smeshchenie impul'sov na elektronno-luchevykh trubakh LO-248.** [Vertical and horizontal displacement of signals on the LO-248 electron tube receivers.] *Meteorologiia i Gidrologiia,* Leningrad, No. 3:52–53, March **1958.** fig. **DWB, DLC**—When used in receivers at radar stations, the LO–248 electron tube is characterized by a short life and reduces the quality of the work of the entire station. This is due to the fact that the tube always receives the signals at the same point. A device for displacing the signals, both along the vertical and horizontal, within the limits of 60 mm without disturbing the circuit of the receiver is described. The entire screen of the tube is used, exact bearings can be made at normal brightness, and the emission current of the tube need not be forced. The circuit diagrams for effecting this horizontal and vertical movement and the circuit diagrams for effecting vertical movement used in the Hydrometeorological Service of the Estonian SSR are illustrated. The required apparatus includes two potentiometers with switches and two batteries at 80 volts each. These batteries are connected in line and their point of connection is grounded. The operation of this device is described. *Subject Heading:* **1. Radar screens.**—*I.L.D.*

11H–18 551.508.85

Bossolasco, Mario and Meda, Fernando, **La registrazione elettrica integrale degli elementi meteorologici.** [Integral electric recording of meteorological elements.] *Geofisica e Meteorologia,* Genoa, 2(5/6):89–92, Sept./Dec. **1954.** 6 figs. **DWB**—The author describes apparatus for recording at a distance atmospheric temperature, relative humidity, rainfall, wind, radiation, atmospheric electricity and visibility. Circuit diagrams of the various devices are presented. *Subject Heading:* **1. Distant recording equipment.**—*I.L.D.*

11H–19 551.501.81:551.515.8:551.553.8(74)

Boucher, Roland J. (*Allied Res. Associates, Mass.*), **A mesosynoptic and radar analysis of two severe New England squall lines.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings,* issued **1958.** Sec. K:14–21. 16 figs., 2 refs. **DWB** (M01.81 R124pc, 1958)—

Detailed analyses of regular hourly sequence reports for 19 June 1957 and 1 June 1956 on a map scale of 1:2,000,000 reveal the development, intensification and decay of mesoscale pressure systems, which can be directly correlated to the development of lines of intense convective activity as observed by radar. The analysis reveals an appreciable time lag between the development in the surface pressure field and the subsequent storm activity. This stresses the importance of using synoptic analysis on the mesoscale in addition to radar observations. By combining radar and mesoanalysis, a basis for short range forecasts of the upsurge or decay of potentially severe convective activity appears possible. *Subject Headings:* **1. Radar analysis of squall lines 2. Mesoanalysis of squall lines 3. New England.**—*Author's abstract.*

11H–20 551.501.81:551.577

Boucher, Roland J. (*Allied Res. Associates, Boston, Mass.*), **Some applications of the CAPPI technique in short range forecasting and research.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. H:8–17. 25 figs., 5 refs. **DWB** (M01.81 R124pc, 1958). Also in Allied Research Associates, Inc., Boston, Contract AF 19(604)-5204, Scientific Report No. 1, March 30, **1959.** 27 p. 24 figs. (incl. photos), 7 refs. **DWB**(M(051) A436sci)—CAPPI records of the McGill CPS-9 comprising four cyclonic cold season precipitation periods are analyzed. The CAPPI technique is found to have valuable applications as an additional research tool in radar studies of precipitation but does not replace conventional PPI and RHI techniques. For operational use the practical advantages of CAPPI over those of other presentations in this type of situation are not self-evident from this limited analysis. The use of CAPPI in summer convective situations is not considered. *Subject Headings:* **1. Constant altitude plan position indicator (CAPPI) 2. Radar precipitation studies.**—*Author's abstract.*

11H–21 551.577:551.501.81

Boucher, Roland J., **Synoptic-physical implications of 1.25-cm vertical-beam radar echoes.** *Journal of Meteorology*, Boston, 16(3):312–326, June, **1959.** 13 figs., 10 refs. (Run previously from Contract report as 9.2-144, Feb. 1958, *Met. Abs.*) **DWB, DLC**—More than 1000 hr of radar records taken with the APS-34 1.25-cm vertical-beam radar during a four-year period have been readily classified into four clearly recognizable types. A limited number of precipitation growth mechanisms is thereby suggested, and the echo types representing them are shown to be well correlated to three basically different classes of synoptic situations. A generalized echo cyclone model is derived. Maximum attainable hourly rates of precipitation are empirically related to the depth of detectable echo. The average vertical distance between the warm-front surface and that of the top of the radar echo above is 12,000 ft with no significant correlation. A marked increase in the frequency of precipitation echoes is found in the temperature interval −11°C to −15°C. *Subject Heading:* **1. Radar synoptic analysis.**—*Author's abstract.*

11H–22 551.501.81:551.577

Boucher, Roland J. and Wexler, Raymond, **Research in radar meteorology.** Allied Research Associates, Inc., Boston, Contract AF 19(604)-3492, Final Report, Pt. 3, May 1–Nov. 31, 1958, issued March 20, **1959.** 10 p. fig., 3 refs., 3 eqs.—A comparatively new technique for displaying precipitation echoes on radar, the Constant Altitude Plan Position Indicator display (CAPPI), is critically reviewed as to its possibilities as a research tool and as a means of presenting radar information for synoptic diagnosis and forecasting. Radar echo patterns along the vertical which indicate rapid changes in the wind profile aloft may be of significant use in forecasting weather conditions up to 12 hrs. Radar detection of echoes associated with the sea breeze at Round Hill reveals some interesting micrometeorological aspects of the sea breeze. Research on the melting of hail indicates that along the 20°C wet adiabat hail of about 1 cm diameter at the 4 km level will completely melt by the time it reaches the surface. *Subject Headings:* **1. Radar precipitation echoes 2. Constant altitude plan position indicator (CAPPI).**—*Authors' abstract.*

11H–23 551.501.81:551.576.1 551.558.29:551.577.3(791)(252)

Byers, Horace R. (*Univ. Chicago*), **Physics of winter precipitation in the desert.** (In: Bolin, Bert (*ed.*), **The atmosphere and the sea in motion.** N. Y., Rockefeller Institute Press, **1959.** p. 400–412. 11 figs., table, 12 refs.) **DLC**—Airplane and radar measurements in winter rain situations in the vicinity of Tucson, Arizona, are plotted and discussed. A combination of stratified cloud layers and convective cells predominates, the cellular types being more in evidence than in winter situations of the more humid regions of this and higher latitudes. The cloud droplet sizes and liquid water contents are similar to those measured elsewhere in the given ranges of temperature. A tabulation of the freezing level on rain days shows that it varies widely but has a median around 8500 feet in January–March which is 2500 feet lower than the mean for all winter days. In some cases precipitation occurs by an all-water process. Counts of giant salt nuclei are high enough to play a

role in such a process. *Subject Headings:* **1. Radar precipitation measurements 2. Winter rainfall 3. Precipitation formation 4. Tucson, Ariz.**—*Author's abstract.*

11H-24 551.501.81:551.509.324.2:551.577

[Caton, P. G. F. and Craddock, J. M.], **Meteorological Office discussion on the use of radar in forecasting precipitation.** *Meteorological Magazine*, London, 87, (1034):233–249, Aug. **1958.** 2 figs., 11 refs. Includes: Craddock, J. M., **Research in the Meteorological Office concerned with long-range forecasting (summary).** p. 239–249. **DWB, DLC**—During the meteorological office discussion, held at the Royal Society of Arts on March 17, 1958, an assessment of the precipitation forecast methods, based on extrapolation of the motion of existing echoes, was made. Considering first shower situations and then forecasts involving belts of precipitation, Caton concluded that, given an adequate range of radar detection, detailed forecasts of a useful standard of accuracy were possible for two hours ahead. The 2–3 hr limit was imposed primarily by the development and decay of the echo pattern. The account by Craddock deals with some of the more important results of long range forecasting carried out at Dunstable from 1954–1958. The following aspects are summarized therein: 1) Choice of a time unit, 2) anomaly patterns, 3) analogue forecasting, 4) selecting the analogues, 5) example of forecasting techniques, 6) analogues used in recent forecasts, and 7) present day development and research. *Subject Headings:* **1. Radar precipitation forecasts 2. Precipitation forecasting 3. Long range forecasting.**—*R.P.*

11H-25 551.501.81:551.515.8:551.553.8(74)

Chmela, Albert C. (*GRD, AF Camb. Res. Center*), **Reflectivity measurements in the vertical through a severe squall line.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. B:17–24. 11 figs., table, 5 refs. **DWB** (M01.81 'R124pc, 1958)—A detailed radar analysis is made of a severe squall line which passed through New England on June 19, 1957, producing five tornadoes and widespread hail. Echo histories including severe weather events, radar severity parameters, and reflectivity profiles for the six major storms are presented. Reflectivities ranged from 1.5×10^6 mm^6/m^3 to 3.5×10^7 mm^6/m^3, with pronounced maxima at altitudes 20–26,000 ft in tornadoes and 16–19,000 ft in hailstorms and windstorms. H_{max} associated with severe surface events was greater than 44,000 ft; H_{max} greater than 50,000 ft was associated with the most severe events. Although these radar characteristics, individually or in combination, are not uniquely indicative of severe weather at the ground, they suggest severe activity somewhere within the storm. *Subject Headings:* **1. Radar analysis of squall lines 2. Storm reflectivity profiles 3. New England.**—*Author's abstract.*

11H-26 551.501.81

Clergue, J., **Système de poursuite automatique sur informations discontinues.** [Automatic tracking system for discontinuous data.] *L'Onde Électrique*, Paris, 39(386):345–351, May **1959.** 7 figs. **DLC**—In this article the author gives a general description of an automatic tracking system of aerial targets actuated from information supplied by a plane coverage radar. The following points are dealt with: a) the use and performance obtained on real echoes in a simple set-up; b) the operational scope offered by the apparatus and its eventual use in association with a complex set-up. The described installation can render services in aerology; it permits simultaneous tracking of several distinct balloons or groups of balloons. *Subject Headings:* **1. Radar tracking 2. Balloon tracking by radar.**—*A.V.*

11H-27 551.508.85:681.84.083

Collis, Ronald T. H. (*Stanford Res. Inst.*), **The use of magnetic tapes in radar weather echo recording and analysis.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. G:9–12. **DWB** (M01.81 R124pc, 1958)—In more sophisticated types of weather echo analysis, it is often necessary to compare observational data obtained during periods and over time intervals of varying duration. From such standpoints as ease of operation, access time to basic data, and equipment expense and complexity, such memory devices as storage tubes and photographic records have serious shortcomings. Magnetic recordings, however, may avoid some, or perhaps even all, of these difficulties. Accordingly, it is worthwhile broadly to survey the capabilities and shortcomings of magnetic tapes for accomplishing such important tasks in radar meteorology, as scan conversion, data playback and echo averaging, contouring, and integration. *Subject Heading:* **1. Radar echo observations on magnetic tape.**—*Author's abstract.*

11H-28 551.501.81:551.577:551.578.1

Collis, Ronald T., **Investigation into the use of magnetic tape recordings of radar precipitation echo signals for hydrological analysis.** Stanford Research Institute, Menlo Park, California, Con-

tract Cwb 9553, Final Report, July 1959. 38 p. 8 figs., table, 16 refs. **DWB** (M(051) S785rep)—The basis of measuring precipitation by radar is described, and the uncertainties and difficulties are discussed. It is concluded that, notwithstanding certain limitations, useful solutions are attainable. Two such solutions are described. The first, an original and comprehensive solution, employs a magnetic tape accounting system to integrate the instantaneous radar reports of rainfall at each intersection of a grid overlying the area of radar coverage. The information of aggregate precipitation is presented in the form of a tabulated print-out, giving in numerical form the depth of precipitation at each grid point. An alternative approach, using a capacitance storage device, integrated precipitation over selected finite areas. A novel presentation of such measurements permits maximum flexibility in the selection of accounting periods, and indicated the total precipitation variations in time. A note on magnetic tape recording techniques is attached as an appendix. *Subject Headings:* **1. Radar precipitation measurement 2. Data processing.**—*Author's abstract.*

11H–29 551.508.85:551.501.81:551.577

Conover, Leslie F. (*U. S. W. B.*) and Hiser, Homer W. (*Univ. of Miami*), **On the problem of estimating rainfall by radarscope photography.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. H:1–7. fig., 8 refs. **DWB** (M01.81 R124 pc, 1958)—The research work accomplished in the past five years, utilizing radar scope photography in estimating rainfall, is reviewed. Emphasis is placed upon the parameters complicating the problem. The techniques employed in photo-integration are discussed and illustrated. *Subject Headings:* **1. Radar scope photography 2. Radar scope rainfall estimation.**—*Authors' abstract.*

11H–30 551.501.81:551.578.7

Cook, Billie J. (*U. S. W. B., Kansas City, Mo.*), **Hail determination by radar analysis.** *Monthly Weather Review*, Wash., D. C., 86(11):435–438, Nov. **1958.** 4 figs., 3 refs. **DWB, DLC**—Radar reports from 17 radar stations are correlated with hail reports for the 4-month period April through July 1956. The relationship between radar detection of precipitation at long ranges and the occurrence of hail is studied. Fifty percent of all echoes reported at ranges of 135 n mi or greater are found to have contained hail. Results of an operational test of the method of analysis are given. Sixty-seven percent of all cases of $\frac{3}{4}$-inch or larger hail reported in the test area are found to have been identified by the term "Hail Indicated" in hourly radar summaries by the Radar Analysis and Development Unit at the time the hail was occurring. *Subject Headings:* **1. Hail observation techniques 2. Radar hail detection.**—*Author's abstract.*

11H–31 551.501.81:551.578.7

Copeland, Robert C. (*M. I. T.*), **A relationship between echo intensity and the observation of hail in New England.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. K:22–30. 4 figs., 3 tables, 12 refs. **DWB** (M01.81 R124pc, 1958)—Through the use of a range-corrected contouring device, quantitative intensity information is available from the SCR-615-B radar, supplementing the normal PPI motion pictures. Such data from 19 June 1957 reveal that hail is frequently observed at the surface in thunderstorms corresponding to the most intense echoes. Storms of reflectivity $Z \geqslant 10^6$ mm^6/m^3 (equivalent rainfall rate, roughly 200 mm/hr) appear to be the most likely hail producers. There is also evidence that some hail may be produced early in the thunderstorm's life cycle, even within the first 10–15 minutes. *Subject Headings:* **1. Radar echo intensity-hail probability relationships 2. Hail probabilities.**—*Author's abstract.*

11H–32 551.501.81:551.576:551.508.57(540)

De, A. C. (*Met. Office, Dum Dum Airport, Calcutta*), **An unusually high Nor'wester radar cloud.** *Indian Journal of Meteorology and Geophysics*, Delhi, 10(3):359–360, July **1959.** figs. **DWB, DLC**—On June 18, 1958, the radar screen of the high power 3-cm meteorological radar, recently installed at Dum Dum airport (India), was full of echoes from large Cu and Cb clouds. At 0900 IST there appeared a squall line echo extending from 315°N in the northwest to 101°N in the northeast at a distance of about 150 km from station. The line as a whole was seen to move toward the station. The observatory at Dum Dum airport recorded a NE'ly squall of moderate intensity at 1315 IST. Some interesting pictures indicating the vertical structures of nor'westers are shown. The height of radar cloud top as obtained on this day was abnormally high. It is known that the reflectivity of the ice particles is much less than that of water droplets but from the nature and intensity of echo it appears that they were mostly from within the cell up to a great height. Hence, the question: whether supercooled water droplets exist up to 23 km or so. The maximum height of radar clouds observed so far at Dum Dum airport is 15 km. The reason for the occurrence of such unusually high Cb cloud is not understood. *Subject Headings:* **1. Radar observation of clouds 2. Dum Dum, India.**—*I.S.*

11H–33 551.515(267):551.501.81

De, A. C. and Sen, S. N. (*both, Met. Office, Calcutta*), **Cyclonic storm of Sept. 13–14, 1958 in the Bay of Bengal: a radar study.** *Indian Journal of Meteorology and Geophysics*, New Delhi, 10(4):393–398, Oct. 1959. 5 figs., 5 refs. **DWB, DLC**—Photographs of radar observations taken at Calcutta of a cyclonic storm of Sept. 13–14, 1958 in the head Bay of Bengal are presented in the paper. It is interesting that with a cyclone of moderate intensity, the eye of the storm was clearly seen on the radarscope in the form of a 'hook', which enabled accurate location of the storm. Such detection of the eye on the radarscope is the first of its kind in the Indian latitudes. The observed dimension and movement of the 'eye' and the associated observed precipitation echoes around the storm centre are discussed. *Subject Headings:* **1. Radar observation of cyclonic storms 2. Calcutta, India.**—*Authors' abstract.*

11H–34 551.555:551.508.85

Decca Radar, Inc., N. Y., **Decca windtracking radar.** (issued 1958?) 5 p. 10 figs., 2 tables. **DWB** (M08.57 D291de)—A description of the new Decca radar equipment is given designed to give a very high accuracy performance yet reduce operational costs of high and low altitude wind detection. Operational results obtained demonstrate the range of its standard size reflectors up to 60 mi. This report compares the results from the Decca windtracking radar with those from other types of systems. *Subject Heading:* **1. Radar wind instruments.**—*N.N.*

11H–35 551.501.81:551.577.51(795)

Decker, Fred W. and Pike, Julian M. (*both, Oregon State College*), **Radar investigations of orographic precipitation.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958. Proceedings*, issued **1958.** Sec. I:40–46. 5 figs., 2 refs. **DWB** (M01.81 R124pc, 1958)—Precipitation near Marys Peak, Oreg., has been examined with tilting bucket gages and vertically-scanning weather radar. Past observations and future plans will be reported. *Subject Headings:* **1. Tilted rain gages 2. Radar observation of precipitation 3. Orographic rainfall 4. Marys Peak, Oreg.**—*Authors' abstract.*

11H–36 551.501.81:551.515.3/4:551.578.7(74)

Donaldson, Ralph J., Jr. (*GRD, AF Camb. Res. Ctr.*), **Vertical profiles of radar echo reflectivity in thunderstorms.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. B:8–16. 4 figs., 8 refs. **DWB** (M01.81 R124pc, 1958)—A systematic examination was made of vertical profiles of the maximum measured CPS-9 radar echo reflectivity occurring in New England thunderstorms during the 1957 season. The measurements were related to surface events reported by a network of cooperative thunderstorm observers. The useful measurements include 90 cases in which rain was the only form of precipitation, and 32 cases involving hail. Three tornadoes occurred during or shortly following reflectivity profile measurements. Median profiles are presented, both for individual measurements and for storm means, in the following categories: non-severe storms releasing only rain, all hailstorms, hailstorms releasing hail of one-half inch diameter or larger, and severe windstorms (including the tornadoes). The data for individual tornado cases are also presented. Some striking differences exist between the median profiles of various categories at altitudes of 20,000 ft and higher, suggesting forecasting utility for this type of radar information. The pronounced maximum in the profiles of severe thunderstorms and tornado-producing storms near 20,000 ft is an indication of intense updraft activity. *Subject Headings:* **1. Radar echoes from thunderstorms 2. Hail frequencies 3. Radar observation of tornadoes 4. New England.**—*Author's abstract.*

11H–37 551.501.81:551.578.73(74)

Donaldson, Ralph J., Jr., **Analysis of severe convective storms observed by radar, Pt. 2.** *Journal of Meteorology*, Boston, 16(3):281–287, June, **1959.** 5 figs., table, 8 refs. **DWB, DLC**—The frequency of hail occurrence in New England thunderstorms during 1956 and 1957 was directly related to the maximum heights and maximum reflectivity factors of the thunderstorm echoes measured by CPS-9 radar. Hail frequencies in excess of 33% occurred in storms with echo heights above 46,000 to 49,000 ft, with little dependence on reflectivity. Higher hail frequencies were found with even greater echo heights and were also strongly related to large values of radar reflectivity factor. The over-all frequency of hail reported in all thunderstorms was 20.6%, considerably larger than the value of somewhat less than five per cent computed for the region by SHANDS. The discrepancy is believed to reflect a difference in definition of thunderstorm area, and an observer bias in favor of the large, hail-producing storms which was evident in the present study. Storms that produced large tornadoes and destructive winds and hail were characterized by significantly greater than average echo heights but not by unusually high echo reflectivities at low altitude. Five storms that resulted in large tornadoes had maximum echo heights during their lifetime of 47,000 ft. to 57,000 ft. In two tornado-bearing storms, limited evidence was obtained for extremely large

values of radar reflectivity factor at high altitudes with a pronounced maximum around 20,000 ft (For Abstract Pt. 1, *see* 9H-19, Aug. 1957, *Met. Abstracts.*) *Subject Headings:* **1. Hail frequencies 2. Radar analysis of hailstorms 3. New England.**—*Author's abstract.*

11H-38 551.501.81:551.578.7(712.3)

Douglas, R. H. (*Met. Service of Canada*) and Hitschfeld, W. (*McGill Univ.*), **Patterns of hail-storms in Alberta.** *Royal Meteorological Society, Quarterly Journal*, 85(364):105–119, April **1959**, 20 figs., table, 8 refs. **Discussion** by J. M. Stagg; L. C. W. Bonacina et al. and **Reply** by Douglas and Hitschfeld in *Ibid.*, 86(368):281–283, April **1960. DWB, DLC.** This article also in *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. K:6–13. 10 figs., table. **DWB** (M01.81 R124pc, 1958)—Between 14 June and 20 Sept. 1957, nearly 3,200 surface reports of hail were collected in a 15,000 sq. mi. area. Information included location, time and duration of hail and the largest size of hail encountered. Continuous radar records of the storm pattern were taken in a manner suitable for the preparation of constant-altitude radar weather (CAPI) maps, to a range of 100 miles. At times, hail fell soon after a first echo (possibly within 10 min.), sometimes no hail occurred for as long as an hour or two. Usually, the hail fell in short bursts (lasting up to 20 min. and spread over a few miles) which would appear to be the products of single storm cells. But on several occasions (notably on 23 July) hail fell continuously for 1½ hours and, without evidence of a multiplicity of cells, covered a strip 30 mi long. Sustained hail came from storms whose echo tops were steady close to 30 kft above surface. Hail associated with echoes of lesser height was not continuous and tended to fall in bursts which sometimes followed closely on the merger of previously separate storms. A study of 83 independent echoes showed that the probability of hail from a given storm was clearly related to maximum height of the storm, rising from zero for storms 10 kft or lower, to 100% for storms 38 kft or more in height. A similar correlation holds between echo height of a hailstorm at any instant and hail arrival at the ground some minutes later. *Subject Headings:* **1. Radar observation of hailstorms 2. Hailstone size 3. Alberta, Canada.**—*Authors' abstract.*

11H-39 551.508.85:551.576.4

Durham, Kneeland, S.; Zabetakis, Stanley G. and Leasure, Richard B., **Airborne cloud base and top indicator, AN/APQ-39.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. F:1–8. 12 figs. **DWB** (M01.81 R124pc, 1958)—This paper presents a brief description of the Airborne Cloud Base and Top Indicator Radar Set AN/APQ-39(XA-2, 10 kmc, and XA-3, 35 kmc). Representative cloud pictures and discussion of cloud detection capabilities of the various models are presented with the emphasis on the XA-3 model. Included are representative airborne cloud pictures (XA-3 models, pictures of XA-3 detection of angels and comparison cloud detection pictures) using a twenty inch and forty one and half inch XA-3 antenna. *Subject Headings:* **1. Radar cloud base and top indicator 2. Airborne weather radar.**—*Authors' abstract.*

11H-40 551.508.85:551.501.81

*East, T. W. R., **Electronic constant altitude plan position indicator for a weather radar.** McGill Univ. Stormy Weather Research Group, Contract AF 19(604)-1579, Scientific Report MW-28, Nov. **1958.** 61 p. 6 figs., numerous charts (fold.), 3 refs. **DWB** (M94.2 M145s)—The Constant Altitude Plan Position Indicator (CAPPI) was developed and is in operation with the AN/CPS-9 weather radar at the University. The PPI display of an AN/CPS-9 radar yields a weather echo from a conical region of the atmosphere, whereas the same radar, modified to render CAPPI displays, features all the precipitation echoes as received from any shallow layer within range at a preselected altitude above the surface of the earth. The prototype of this novel CAPPI system is here explained as divided into five parts by function, viz: (1) the elevation controller, which governs the scanning and the other four components: (2) the gating circuits, select and/or reject information ad libitum, (3) the storage unit, retains the desired information as obtained by its tubes which are scanned by the (4) radial deflection system and upon completion (5) the TV-system extracts this information and displays it. The detailed description is supported by block, circuit, and wiring diagrams. It is concluded that the elevation controller operated satisfactory since start 1956. The sound concepts of the storage unit and the TV-display are in the process of refinement. *Subject Headings:* **1. Weather radar 2. Radar equipment.**—*W.N.*

11H-41 551.508.85

East, T. W. R. and Marshall, J. S. (*both, Stormy Wea. Group, McGill Univ.*), **Multiple constant-altitude plan position indicators.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. F:41–43. 3 figs. **DWB** (M01.81 R124pc, 1958)—Multiple CAPPI radar patterns can be produced during each 3.6-min cycle of the antenna elevation program. Photographic storage on fast-process film gives the highest-quality CAPPI records attainable at

present. For each available PPI-display equipped with a special video switch, a CAPPI of different altitude is built up. Storage tubes, with two of them working as pairs into one TV-monitor, lend themselves more easily to automation, and are somewhat faster in use than film. A more economical arrangement, with the advantage of yielding permanent records, is to deed information from five storage tubes in sequence into a single facsimile receiver. In four minutes, four CAPPI records at different heights and one long-range PPI can be obtained. Whatever the particular program, lengthening the scanning cycle of the antenna is undesirable; similarly, raising the beam to more than 20°-elevation is unnecessary and uneconomical except for shortest-range equipment. The introduction of an antenna whose beam broadens in the vertical as it is raised would permit further economies in time, or alternatively, an improvement in height resolution. *Subject Headings:* **1. Constant altitude plan position indicator (CAPPI) 2. Radar echo patterns.**—*Authors' abstract.*

11H–42 551.501.81:551.510.62(422)

Eastwood, E.; Bell, J. D. and Phelp, N. R., **"Rings Angels" over south-east England.** *Nature*, London, 183(4677):1759–1760, June 20, **1959.** 2 figs., 3 refs. **DWB**—A ripple-like radar display was observed Feb. 17, 1959 on a high-power L-band radar with video map superimposed on the PPI. The dynamic growth of the 18 rings emitting from the center at an average periodicity of $2\frac{1}{2}$ min had a maximum diameter of 20 mi. In absence of any plausible explanation some characteristics of the "Ring angels" noted are: No topographical influence found; no unusual bird roosting; not observed over sea; do not exceed 2,000 ft; centers a few minutes before sunrise; observed at several active centers simultaneously; different weather conditions but <15 knots wind speed; winter prevalence apparent; periodicity between successive rings $1\frac{1}{2}$–12 min; expansion velocity 22–55 m.p.h. Rings diffuse by increased diameter, maximum of which is 30 mi. The angel centers are shown in a map. *Subject Headings:* **1. Radar angels 2. England.**—*W.N.*

11H–43 551.501.81:598.2:591.174

Edwards, J. (*Royal Aircraft Estab., Farnborough*) and Houghton, E. W. (*Royal Radar Estab., Great Malvern*), **Radar echoing area polar diagrams of birds.** *Nature*, London, 184(4692) Suppl. No. 14:1059, Oct. 3, **1959.** fig., table, 4 refs. **DWB**—The measurement made of the echoing area polar diagrams of birds, using a high-resolution x-band radar, are reported. Each bird in flying position, but with wings closed and legs retracted, was fixed to a nylon cord. The cord was held vertically between ground and an aerial line. Typical azimuth-polar diagrams for three birds are shown. The bird echoing areas were evaluated by comparison with standard metal spheres. *Subject Heading:* **1. Radar bird flight observations.**—*I.S.*

11H–44 551.594.2:551.576.11:551.508.94:551.507.352:551.501.81

Fitzgerald, D. R. and Byers, H. R. (*both, Univ. of Chicago*), **Aircraft observations of convective cloud electrification.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 15(3/4):254–261, Oct. **1959.** 4 figs., 2 refs. "A longer version of this paper was given at the Toronto Meeting of IUGG on Sept. 6, 1957." **DLC.** Also issued in: *Conference on Atmospheric Electricity, 2nd, Portsmouth, N. H., May 1958, Proceedings*, issued **1958.** p. 245–268. 13 figs., 2 tables, 8 refs. **DWB** (M(055) C748pr)—A horizontal component of the potential gradient in and around developing trade-wind and extra-tropical cumulus clouds has been measured with field meters mounted in the wingtips of an airplane. Characteristic similarities and differences in the electrostatic behaviour of all-water and of mixed-phase clouds studied in 1953–55 are discussed. A correlation of these effects with the development of radar echoes in the cloud is given. *Subject Headings:* **1. Convective cloud electrification 2. Air-borne electric charge instruments 3. Radar analysis of clouds.**—*Authors' abstract.*

11H–45 551.501.81

Foster, Hal (*RADU, W. B. Forecast Center, Kansas City, Mo.*), **Critical problems in RADU.** *Weather Radar Conference, 6th, Cambridge, Mass., March 26–28, 1957, Proceedings*, pub. **1957.** p. 367. **DWB** (M01.81 R124 pc)—Standard codes and reporting procedures are considered essential for efficient use of radar meteorological reports for pilot briefing and preparation of local forecasts. It is also difficult to summarize data from sets with different operational capabilities. *Subject Headings:* **1. Radar meteorological reports 2. Radar Analysis and Development Unit (RADU).**—*M.R.*

11H–46 551.509.326:551.501.81:551.515.4

Franceschini, Guy A. (*A & M Coll. of Texas*), **A probability factor for thunderstorm warnings.** *American Meteorological Society, Bulletin*, 41(1):28–30, Jan. **1960.** 2 figs., 2 eqs. **DWB**—An objective method is suggested which will enable forecasters to determine a direct probability-of-occurrence factor to be included with thunderstorm warnings. The method is based on radar observations and employs a simple grid overlay. The fractional area of the radar scope covered or traversed by thunderstorm echoes is used to determine the probability factor. *Subject Headings:* **1. Radar thunderstorm detection 2. Thunderstorm warnings.**—*Author's abstract.*

11H–47 551.501.81:551.515.2:551.577.1

Fujita, Tetsuya (*Dept. of Met., Univ. of Chicago*), **Mesoanalysis of hurricane rainbands.** (In Technical Conference on Hurricanes, Miami Beach, Fla., Nov. 19–22, 1958, **Proceedings,** issue **1958** (?) Section C6 (8 p.) 6 figs.) **DWB** (M15.2 A512 pr). Issued in abstract form in: *Weathe Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. K:73 **DWB** (M01.81 R124pc, 1958)—Preliminary analysis of the rainbands of Hurricane "Diane", "Ione and "Carrie" was made in order to reveal if they were expanding or shrinking. It was found tha the answer to this will considerably vary, if the rotation of the hurricane is taken into consideratior The results obtained so far show that rainbands do expand or shrink. A technique of constructin time-adjusted airplane radar echo charts is discussed briefly. As an example, a chart was prepare showing the fine structure of the spiral rainbands surrounding the eye of hurricane "Carrie." *Subje Headings:* **1. Radar echoes from hurricanes 2. Hurricane rainbands.**—*Author's abstract.*

11H–48 551.501.81:551.515.

Fujita, Tetsuya (*Univ. of Chicago*), **Tornado cyclone: bearing system of tornadoes.** *Weathe Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958. Proceedings*, issued **1958.** Sec K:31-38. 6 figs., 5 refs. **DWB** (M01.81 R124 pc, 1958)—This paper summarizes the characte istics of tornado cyclones, three to thirty miles in diameter, which were observed visually, by radar or by means of organized barograph traces. It became evident that the tornadoes appearing alon the tornado cyclone path are the secondary circulations imbedded in the cyclone field. *Subje Heading:* **1. Radar observation of tornadoes.**—*Author's abstract.*

11H–49 551.501.81:551.578.

Fujiwara, Miyuki (*Met. Res. Inst., Tokyo*), **Formation of stationary rainbands.** *Weather Rada Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. I:33-3 8 figs., 7 refs. **DWB** (M01.81 R124pc, 1958)—A radar and synoptic study on the storm that oc curred around a stationary front in the subtropical region was performed. The present repor describes the stationary rainbands which appeared within the warm region of the wave front. *Subje Headings:* **1. Radar analysis of stationary rainbands 2. Radar echoes from rain.**—*Author's abstrac*

11H–50 551.501.81:551.77

Fujiwara, M. (*Met. Res. Inst., Tokyo*), **Rainbands and a weather system around a wave cre in humid season.** *Papers in Meteorology and Geophysics*, Tokyo, 9(2):63–86, Dec. **1958.** 21 fig (incl. photos), 11 refs. Japanese summary p. 86. **DWB**—Radar and synoptic analyses were mad of the storm that occurred around a stationary Bai-u front. Many various echo patterns tha appeared were compared with the synoptic situations. Then a weather system around the wav crest of small scale was represented, in which two squall lines and quasi-stationary and perfectl stationary rainbands were involved. On the rainbands, some detailed explanations are give *Subject Headings:* **1. Radar echoes from rain 2. Synoptic analysis.**—*Author's abstract.*

11H–51 551.508.85:551.501.81(520

Fukuoka District, Japan. Central Meteorological Observatory, **A weather radar on Mt. Sefur** *Geophysical Magazine*, Tokyo, 27(3):387–394, Sept. **1956.** 7 figs., ref. **DWB, DLC**—In order t aid the further success in both electronics as well as meteorology, operational and qualitative ex planations at the first experiments of a newly designed weather radar of 5.7 cm wave length, whic was placed on Mt. Sefuri and Fukuoka Observatory, a distance of 16.6 km, is comparatively describe together with "radar relay" which disseminates the video information of the radar scope to a fore casting center at a distance from the radar station. Detailed results of the preliminary operatio of the equipment and those of the storm observations during the passage of the typhoon, Louis September, 1955, are also reported. *Subject Headings:* **1. Radar weather installations 2. Mt. Sefur Japan.**—*Authors' abstract.*

11H–52 551.501.81:551.553.6:551.577.3

Fulmer, Allen L., **Determination of storm intensity using radar.** (In: Decker, Fred W. et al **Instrumentation and techniques for Army weather observation.** Oregon. State College, Corvalli Dept. of Physics, Contract DA-36-039 SC-73186, 3d Quarterly Technical Report, **1957.** p. 7–1 20 refs.) **DWB** (M01 066i)—This report summarizes the techniques and instruments that hav been examined to date for the purpose of determining the intensity of wind and precipitation. Th observational and instrumental techniques of rainfall intensity are discussed. Certain empiric corrections to the radar equations derived have introduced some discrepancy which has not receive a satisfactory explanation as yet. The instrumental techniques on wind intensity are characterize by the use of chaff, the "R" meter, and the sonic anemometer which is an instrument solely fo research work. *Subject Headings:* **1. Wind intensity measurement techniques 2. Rainfall intensit measurement techniques 3. Wind instruments 4. Precipitation instruments 5. Radar analysis storms.**—*N.N.*

11H–53 551.501.81:551.515

Fulmer, Allen L., **The role of instrumental techniques in the measurement of storm intensity.** In: Decker, Fred W., et al., **Instrumentation and techniques for Army weather observation.** Oregon. State College, Corvallis. Dept. of Physics, Contract DA-36-039 SC-73186, 4th Quarterly Technical Report, **1958.** p. 7–9. 4 refs.) **DWB** (M01 066i)—While still recognizing the importance of radar observation by the use of PPI, the author feels that the new RHI discussed in this report has greatly enhanced the value of radar data. The role of sferics in determining the intensity and location of severe storm centers is explained. It has led to the assertion that weather observations by radar alone do not reveal the location and actual path of the storm centers. *Subject Headings:* **1. Radar storm detection 2. Sferics storm detection 3. Storm intensities.**—*N.N.*

11H–54 551.501.81:551.594.12

Gallagher, P. B. and Villard, O. G., Jr., **Radio reflections from artificially produced electron clouds: Smokepuff II.** Stanford Univ. Radio Propagation Lab., Stanford, Calif., Contract AF 19(604)-2075, Scientific Report No. 1, Dec. 15, **1958.** 38 p. 18 figs., 5 tables, 13 eqs.—Ionic clouds chemically seeded in the E-region of the ionosphere above New Mexico have been detected using ionospheric radars. Discrete radar echoes in the HF and VHF range were observed for up to two hours following the successful release of the chemical constituents from an Aerobee rocket at approximately 118 km altitude. Indications from radar data are that approximately 10^{20} electrons were produced, yielding critical frequencies above 23 Mc for a time duration of approximately 30 sec. Analyses of radar records from various radars suggest that within several minutes of the chemical release, the ionic cloud assumed, roughly, proportions of a horizontally disposed prolate spheroid many hundreds of meters in diameter. Splitting of the cloud and a subsequent two-component drift motion were also observed during the early stages of its existence. During this period, critical frequencies remained between 6 and 8 Mc, sufficient to support normal communication in the upper portion of the HF band. Amateur reports on this count could not be evaluated, however, due to the very high F layer critical frequencies that existed at this time. Study of the echo decay and fluctuation pattern show that normal diffusion predominates for the first half minute. Following this period, the echo decay rate drops to a negligible value, and ionization densities appear to be supported predominantly by solar energy. This report is a preliminary draft and is not in a form intended for widespread circulation or subsequent publication. *Subject Headings:* **1. Radar reflection from electron clouds 2. Electron density in E layer.**—*Authors' abstract.*

11H–55 551.508.85 551.501.81:551.515.4(548):536.421

*Gupta, B. K. and Venkiteshwaran, S. P. (*Met. Office, Poona*), **Radar observation of supercooled water in thunderstorms at Poona.** *Indian Journal of Meteorology and Geophysics*, 9(2):167–170, April **1958.** 3 figs., 2 tables, 3 refs. **DWB, DLC**—The maiden installation of a search radar type 17C, operating on 9.1 cm, at Poona is reported. The instrument was installed in 1953 and in 1954 radar observations of rain began. This report gives data on the mean and maximum heights of supercooled water over Poona during the thunderstorms. Thunderstorms reach maximum heights during May–June and are least during September-October. *Subject Headings:* **1. Radar observation of thunderstorms 2. Supercooled water in thunderstorms 3. Radar equipment 4. Poona, India.**—*N.N.*

11H–56 551.501.81:551.515:551.509.327(764)

Hamilton, John W. (*W. B. Airport Station, Oklahoma City*), **Some features in the use of radar in forecasts and warnings of heavy hail, damaging winds and/or tornadoes.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. H:18–25. 14 figs., 2 refs. **DWB** (M01.81 R124pc, 1958)—The severe thunderstorms that developed on the afternoon of April 21, 1958, in north-central Texas moved southward producing heavy hail, damaging winds, and a tornado. The life history of this storm as it developed and moved southward is revealed by the analysis of the radar echoes from two radar stations in the Weather Bureau Radar Network. For three hours the thunderstorms moved southward at an average speed of 40 m.p.h. *Subject Headings:* **1. Radar storm forecasting 2. Radar analysis of storms 3. Radar tornado tracking 4. North-central Texas.**—*Author's abstract.*

11H–57 551.501.81:551.511:598.2(420)

Harper, W. G. (*Met. Office, East Hill, Eng.*), **An unusual indicator of convection.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. D:9–16. 4 figs., 9 refs. **DWB** (M01.81 R124pc, 1958)—Explanation is offered of lines of echo which lie up-and-downwind, and of intense arcs of echo, sometimes roughly parallel to the edges of cumulonimbus masses but separated from them by a few miles, which have been recorded on 10-cm radar at East Hill. Patterns of considerable meteorological interest have been recorded. It is shown that these can be caused by aerial-feeding birds, usually against such murky backgrounds of

cloud that it is difficult to appreciate their numbers. In England the birds involved are usually Swifts (*Apus apus*). The Swifts act as indicators of a stage of convection not otherwise detectable by radar. Analogy is drawn with 'convective' angels reported from America. *Subject Headings:* **1. Radar echoes from birds 2. Bird convection indicators 3. England.**—*Author's abstract.*

11H–58 551.501.81:621.396.9

Harper, W. G., [**Discussion of**] **R. F. Jones: Radar echoes from atmospheric inhomogeneities and** [**Reply by**] **Jones.** *Royal Meteorological Society, Quarterly Journal*, 85(366):435–436, Oct. **1959**. 4 refs. **DWB, DLC**—The letter critically examines R. F. JONES' side-lobe explanation of "angel" type radar echoes. Four objections are raised and discussed. Then, on the basis that the total reflection cannot explain echoes above 0.4° elevation, it is concluded that atmospheric inhomogeneities are a most unlikely cause of radar "angels." In his reply, the author defends his thesis against each objection and states that these objections are by no means sufficient to rule out his explanation. (For abstract on original article, *see* 10.8–132, Aug. 1959, *Met. Abstracts.*) *Subject Heading:* **1. Radar angels.**—*I.S.*

11H–59 551.501.81

Hershman, Arthur L. and Decker, Fred W. (*both, Oregon State College*), **A system for educational weather radar research.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958 Proceedings*, issued **1958**. Sec. G:25–27. 3 refs. **DWB** (M01.81 R124pc, 1958)—The complete instrumentation of a comparatively low-cost weather radar research system is outlined. Present uses of the sytem are cited as well as future proposals. *Subject Heading:* **1. Radar weather research.**—*Authors' abstract.*

11H–60 551.508.85:551.501.81:551.515.2

†*Hiser, H. W. and Ray, P. R., **Radar meteorological studies, Feb. 1, 1958 Jan. 31, 1959.** Miami Univ. (Coral Gables, Fla.). Marine Lab., Contract NOas 58-388-d, Final Report, No. 8904-4, 40 p. 14 figs. (incl. photos), 22 refs., 4 eqs. +numerous figs. & tables in appendix. **DWB**—A ranged corrected logarithmic radar receiver, a master power supply, and an I.F. pulse generator, which were developed under the contract, are described and schematics are presented. The results of a survey of radars for possible future meteorological use are presented. Research on anomalous propagation and "thin bands" is described. A comparison of observations on the CPS-9, SP-1M, and MPS-4 radars and a summary of radar observations of 1958 hurricanes that approached south Florida are also included. *Subject Headings:* **1. Radar weather installations 2. Radar observation of hurricanes.**—*Author's abstract.*

11H–61 551.501.81:551.577

Hiser, H. W.; Ray, P. R. and Conover, L. F., **Investigation of rainfall measurement by radar.** July 1, 1957 to June 30, 1958. Miami Univ. (Coral Gables, Fla.). Marine Lab., Contract Cwb-9283, Final Report, June **1958**. 45 p. figs., photos, table, 5 refs., 8 eqs. **DWB**—A breadboard type installation of a storage tube was made in a Navy model VD-2 repeater. System dynamic range tests were run for the equipment used by the project for photo-integration of rainfall echoes. The system dynamic range was found to be about 15 decibels in terms of power received from a target or about 10 decibels in terms of rainfall as given by the theoretical radar-rainfall equation. The dynamic range of the Fine Grain Positive film used far exceeds that of the radar. Investigations of the model VD-2 radar repeater showed it to be the weakest link in the system in use on the project. The signal dynamic range and the bandwidth of its video amplifier are inadequate. Its unblanking gate appears to be influencing the CRT beam intensity. PPI scope sweep writing speed tests were conducted which showed that the range-mark generator in the model VD-2 repeater produced variations in the sweep intensity. A theoretical equation for the effects of sweep writing speed was developed and applied. Necessary range corrections, receiver saturation, and other variables made it difficult to evaluate this equation. Comparison integrations made on the modified SP-1M and the WSR-1 radars showed that photo-integrations of rainfall can be made on the WSR-1 with a reasonable degree of accuracy. Examples of point and areal analyses of echo densities from integrated photographs are presented. *Subject Headings:* **1. Radar rainfall measurements 2. Radar photographs. I. Miami. Univ. (Coral Gables, Fla.). Marine Lab. II. Contract Cwb-9283.**—*Authors' abstract.*

11H–62 551.577:551.501.81:551.515.4:551.558.1

Hitschfeld, Walter, **The motion and erosion of convective storms in severe vertical wind shear.** *Journal of Meteorology*, 17(3):270–282, June **1960**. 17 figs., 14 refs., 3 eqs. **DWB.** More extensive study issued as: McGill Univ. Stormy Weather Research Group, Contract AF 19(604)-2065, Scientific Report MW-29, July **1959**. 47 p. numerous figs., 15 refs., 2 eqs. **DWB** (M94.2 M145s)—Radar data displayed in the form of precipitation maps at constant altitude above ground (CAPPI) portray

the structure of storms and their anvils in telling manner. Well developed storms, even in the presence of severe wind shear, were observed to remain essentially vertical through their active phase. Instead of being strongly bent by the shear, parts of the storm appeared to be carried off by the wind, forming extensive plume patterns or anvils which trailed down to levels as low as 10,000 ft while evaporating. Size and shape of the plume suggested that its particles had fall speeds ranging from 0.75 to about 5 m sec^{-1}, and thus were of precipitation size. The motion of the entire storm system is related to the wind at low levels, but only in a general way. Instances where the echo motion differs substantially from the observed winds at all heights are quite common. Vertical motion and storm erosion are used to explain how the active core of the storm remains nearly vertical, almost independently of the wind shear. In the Appendix, a statistical analysis of the precipitation patterns of two of the days analyzed in the body of the report is presented. This work includes a statistical measure of echo distribution as a function of height, and the derivation of a correlation index (probability of finding echo at a specified horizontal range and bearing from a point with echo.) *Subject Headings:* **1. Radar analysis of storms 2. Radar observation of convective clouds 3. Convective cloud structure.**—*Author's abstract.*

11H–63 551.501.81:551.577

Hitschfeld, Walter and Gunn, K. L. S. (*both, Stormy Wea. Group, McGill Univ.*), **The distribution and continuity of echoes on CAPPI weather records.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings,* issued **1958.** Sec. A:10–16. 9 figs. **DWB** (M01.81 R124pc, 1958)—Statistical analysis of precipitation patterns on the CAPPI-type display provides useful measures of radar response and echo distribution. The ratio of echo area to total area in these horizontal sections when viewed as a function of range can serve as an index of radar performance; when regarded as a function of height the same ratio reveals significant differences between summer and winter precipitation. For typical summer storm echoes a statistical measure of echo size and distribution is provided by a correlation index (probability of finding echo at specified horizontal range and bearing from a point with echo). Texture of typical snow echo is investigated by estimating the relative contributions to the total echo area by small and large fragments. *Subject Headings:* **1. Constant altitude plan position indicator (CAPPI) 2. Radar precipitation echoes.**—*Authors' abstract.*

11H–64 551.501.81:551.515.3(764,781)

Holmes, David W. and Smith, Robert L. (*both, U. S. W. B., Wash., D. C.*), **Doppler radar for weather investigations.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17 20, 1958, Proceedings,* issued **1958.** Sec. F:29–36. 10 figs., 7 refs. **DWB** (M01.81 R124pc, 1958)—A simple, low-powered 3 cm experimental Doppler radar has been in operation this past season at Wichita Falls, Tex., and Wichita, Kans. The purpose of the project is to evaluate the usefulness of this type of radar for identifying tornadoes by detecting the high-speed motions of particles associated with them. Despite numerous equipment difficulties, some very useful data were obtained. Speeds of particles in a tornado were measured directly for the first time. This paper will present the data obtained, discuss the operational problems, and make recommendations for Doppler radar equipment that would be better suited to weather detection than that now being employed. *Subject Headings:* **1. Doppler radar 2. Radar observation of tornadoes 3. Wichita Falls, Texas 4. Wichita, Kans.** —*Authors' abstract.*

11H–65 551.501.81:551.509.318:551.577.37(773)

§Huff, F. A.; Hiser, H. W. and Stout, G. E., **The October 1954 storm in northern Illinois.** *Illinois. State Water Survey Div., Report of Investigation,* No. 27, **1955.** 23 p. 16 figs. (incl. photos), 2 tables, 11 refs., 3 eqs. **DLC**—Surface, 500 mb and precipitable water maps illustrate the synoptic conditions which caused a record flood in Illinois. Radar echoes are compared with rainfall amounts on 18 charts. The CPS-9 equipment used can portray the areal extent of light rainfall, but only delineates the forward edge and the horizontal extent of an approaching moderate or heavy rainstorm. Neither the length or the intensity of such a rainstorm can be accurately determined by radar. Our radar meteorologist should be well familiar with the fallacies of 3 cm radar; only then will he be able to derive useful information to supplement the analysis of the conventional weather maps. *Subject Headings:* **1. Synoptic conditions for heavy rainfall 2. Illinois.**—*A.A.*

11H–66 551.501.81:551.578.11(795)

Hunsucker, Robert D. and Decker, Fred W. (*both, Oregon State College*), **Observations of the relationship between raindrop-size distribution and the existence of radar bright-layers.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings,* issued **1958.** Sec. B:33–34. table. **DWB** (M01.81 R124pc, 1958)—Preliminary analysis of statistical data on raindrop size distribution at Oregon State College, utilizing the raindrop camera, has revealed a relationship between the raindrop size distribution type and the existence of radar bright-layers. The data

available show a preference for a unimodal drop size distribution accompanied by two or more radar reflecting layers. *Subject Headings:* **1. Raindrop size distribution 2. Radar precipitation echoes 3. Oregon.**—*Authors' abstract.*

11H–67 551.509.57 551.501.81:551.577

Hunsucker, Robert D. and Sutton, Robert W., **Precision tracking of storm cells and bands.** (In: Decker, Fred W. et al., **Instrumentation and techniques for Army weather observation.** Oregon. State College, Corvallis. Dept. of Physics, Contract DA-36-039 SC-73186, 3d Quarterly Technical Report, **1957.** p. 16–29. fig., 2 tables, 6 refs.) **DWB** (M01 066i)—The standard operating procedures for tracking and prognosticating the movement of precipitation lines and cells are treated. Weather radar echoes are classified as convective precipitation, stratiform or mixed. The stratiform echoes are further sub-grouped into eight classes and defined accordingly, with illustrations. Any convective echo developing from the surface of the earth to beyond 30,000 ft is almost surely a thunderstorm. Various methods adopted to secure usable weather data from a radar scope screen, and the linear and nonlinear approaches to the problem of weather radar extrapolations are outlined and evaluated. *Subject Headings:* **1. Radar precipitation echoes 2. Radar observation of storm structure.**—*N.N.*

11H–68 551.501.81:551.577.37(73)

Illinois. State Water Survey. Meteorologic Lab. at Illinois Univ. **Study of intensity of surface precipitation using radar instrumentation.** Contract DA-36-039 SC-75055, Project DA-3-99-04-112, First Quarterly Technical Report, April 1, 1958 to June 30, **1958.** 7 p. Also: Second Quarterly Technical Report, July 1, 1958 to Sept. 30, **1958.** 18 p. table, 3 refs. Fourth Quarterly Technical Report, Jan. 1 to March 31, **1959.** 10 p. 3 tables, 2 refs. Fifth Quarterly Technical Report, April 1 to June 30, 1959, issued **1959.** 15 p. 3 tables. Sixth Quarterly Technical Report, July 1 to Sept. 30, **1959.** 21 p. table. Seventh Quarterly Technical Report, Oct. 1 to Dec. 31, **1959.** 11 p. 7 figs., eq. Eighth Quarterly Technical Report, Jan. 1, 1960–March 31, **1960.** 10 p. **DWB** (M01.81 I29i)—Routine reports on collection and analysis of raindrop data using CPS-9 and TPS-10. Information given includes: amount of film collected and/or analyzed at different stations involved in project (e.g., Oregon, Alaska, Miami, Majuro [Marshall Islands]), modifications and/or repairs made on instruments, additions to existing instrumentation, progress of new stations being added to the project. *Subject Headings:* **1. Radar analysis of precipitation 2. Precipitation intensities 3. United States. I. Mueller, E. A. II. Stout, G. E. III. Ackerman, W. C.**—*A.J.M.*

11H–69 551.501.81:551.578.11

Imai, Ichiro (*Met. Res. Inst., Tokyo*), **Attenuation of microwaves through rain for various drop-size distributions.** *Meteorological Society of Japan, Tokyo, 75th Anniversary Vol. of the Journal*, pub. Nov. **1957.** p. 65–71. 8 figs., 3 tables, 15 refs., 7 eqs. **DWB, DLC**—The attenuation of microwaves by rain at 3.2, 5.7 and 10 cm wave lengths are computed. By using Laws and Parsons' drop size distributions, respective formulas for the three wave lengths, $0.007R^{1.3}$, $0.0013R^{1.1}$ and $0.0003R$, are obtained. Calculations based on drop size data obtained by the M.R.I. group show that the attenuation at 3.2 cm, for a given rainfall rate R, is largely dependent on radar reflectivity Z for $R>1$ mm/hr. On the contrary, the attenuation at 5.7 cm depends only upon R approximately. For radar rainfall measurements, 5.7 cm wave length is considered to be more appropriate than 3.2 cm. *Subject Headings:* **1. Microwave attenuation by raindrops 2. Radar rainfall measurement techniques.**—*Author's abstract.*

11H–70 551.501.81:551.515.3:551.577(77)

Inman, Rex L. and Bigler, Stuart G. (*both, A & M College of Texas*), **A preliminary classification of radar precipitation echo patterns associated with Midwestern tornadoes.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. I:16–25. 11 figs., 5 refs. **DWB** (M01.81 R124pc, 1958)—A survey of Midwestern severe storm situations, as observed by several ADC radars, has been made in an effort to reveal the distributions of radar precipitation echoes with which tornadoes are associated. These storms are grouped according to their appearance on time-lapse PPI scope photographs into several types including isolated and scattered echoes, widespread sheet echoes, and several categories of line echoes. Characteristic features of each of these types are described and illustrated. *Subject Headings:* **1. Radar precipitation echoes 2. Radar observation of tornadoes 3. Midwest United States.**—*Authors' abstract.*

11H 71 551.501.81:551.577

§Jacobs, Lloyd E., **Kinematics of precipitation echoes.** Texas. Agricultural and Mechanical College. Dept. of Oceanography and Meteorology, Contract AF 19(604)-1564, Technical Note, No. 3, Nov. **1957.** 14 p. 25 figs., 2 tables, 2 refs. **DWB** (M94.7 T355te)—This is a study of the velocities of small precipitation areas and the larger storm systems of which they are the elements.

Warm-frontal and pre-cold-frontal storm systems are examined. It is found that the motion of small precipitation areas is the same as that of the system as a whole in the case of warm-frontal precipitation. In pre-cold-frontal systems, on the other hand, systems and the small precipitation areas of which they are composed move with different velocities. The observed difference in the movement of individual echoes and that of the associated pre-cold-frontal squall line would suggest a possible intensification of the thunderstorm due to the lifting action of the "bubble high" at the surface. Such an intensification, however, was not noted in this study, and if it exists, it is probably of minor importance among factors influencing the intensity of the thunderstorms. A very important finding is that observations of small precipitation area positions from which their velocities are obtained cannot be made at intervals exceeding about five minutes if accurate results are desired. *Subject Headings:* **1. Kinematics of precipitation echoes 2. Radar precipitation echo movements.**—*Author's abstract.*

11H–72 551.507.352:551.515.21:551.501.81

Jordan, C. L. (*Florida State Univ.*); Hurt, David A. and Lowrey, Clifford A. (*both, USN, Jacksonville, Fla.*), **The structure of Hurricane Daisy on Aug. 27, 1958.** Florida. State Univ. (Tallahassee). Dept. of Meteorology, Contract Cwb-9395, Scientific Report, Aug. 15, **1959.** 29 p. 12 figs., 14 refs. **DWB** (M(051) F636st)—An unusually large amount of aircraft reconnaissance data is available from flights into Hurricane "Daisy" on 27 Aug. 1958. These data consist primarily of detailed flight level information collected by the research aircraft of the National Hurricane Research Project and radarscope films taken from the operational reconnaissance aircraft of the U. S. Navy. Hurricane "Daisy" was a small, slow-moving storm off the Florida east coast on 27 Aug. with winds in excess of 100 kn in the lower troposphere. The concentrated nature of this vortex is clearly shown by the flight-level wind and temperature data, and by the weather patterns shown on the radar films. The films from the search radar show a central, ring-like echo only a few miles thick which corresponds closely with the area of maximum observed winds. The height-finding radar shows this central echo—which is associated with the wall clouds surrounding the hurricane eye—to be nearly vertical and to extend to about 60,000 ft. *Subject Headings:* **1. Hurricane "Daisy" (1958) 2. Hurricane reconnaissance 3. Radar observation of hurricanes.**—*Authors' abstract.*

11H–73 523.164.83

†Kerr, Frank J., **Radio echoes from sun, moon and planets.** *Handbuch der Physik,* Berlin, 52:449–464, **1959.** 8 figs., table, numerous refs., 11 eqs. **DWB**—A review of knowledge up to 1958 of radar echoes and their characteristics, or possible characteristics, when reflected from the moon (since 1946), the sun and the planets (if and when accomplished), and from the ionosphere aurora, meteors, whistlers, etc. Future possibilities are as challenging as the actual performance is remarkable. Radio communications via the moon are discussed in some detail and references cited systematically. *Subject Headings:* **1. Radio echoes from moon 2. Radio echoes from sun and planets.**—*M.R.* Ⓢ

11H–74 551.501.81:551.577:551.509.324.2

Kershaw, Herbert, Jr., **Evaluation of linear extrapolation of radar precipitation echoes for various synoptic weather types.** (In: Decker, Fred W. et al., **Instrumentation and techniques for Army weather observation.** Oregon. State College, Corvallis. Dept. of Physics, Contract DA-36-039 SC-73186, 5th Quarterly Technical Report, **1958.** p. 23–25. table.) **DWB** (M01 O66i)—This progress report is an initial work in evaluating statistically the wealth of U. S. radar films and of the radar synoptic meteorological data in order to determine the confidence factors that might be used in short range forecasting of the movements of precipitation cells. The 4 methods adopted for the investigation of linear extrapolation of radar precipitation echoes for the various weather types are discussed and sample results of such objectivity tests are cited. *Subject Headings:* **1. Radar precipitation forecasting 2. Statistical analysis of radar data. I. Oregon. State College, Corvallis. Dept. of Physics II. Contract DA-36-039 SC-73186.**—*N.N.*

11H–75 551.508.85:551.501.81:551.577

Kessler, Edwin, III (*G. R. D., AFCRC*), **Reflectivities from unmodified radar displays.** *Weather Radar Conference, 6th, Cambridge, Mass., March 26–28, 1957, Proceedings,* pub. **1957.** p. 315–320. 7 figs., 9 refs. **DWB** (M01.81 R124pc)—The three dimensional distribution of radar "Z" or related factor may be determined from RHI photos taken under controlled conditions. With stable radar operation, the relation between minimum detectable signal on the RHI and range is determined only by 1) receiver gain, 2) range variation of receiver response. Precipitation echoes, especially of the stratiform type, may themselves be used to check the calibration, since in the absence of topographic effects, the average normalized echo power should be independent of range. In the absence of information on items 1) or 2), above, (but not both) precipitation echoes can be used to

formulate a relative calibration. An overall absolute calibration is immediately given by the relative calibration and a quantitative determination at one gain and range. Application of this method is very simple and gives geometrically accurate distributions within a tolerance comparable to that of other techniques. The method may be applied to the PPI also, and is of value for the determination of the intensity of thunderstorms. In any case, the original film data are in easily handled form and are fairly comprehended, even before quantitative work is begun. Last, it is noted that the speed of data collection is such that three dimensional distributions may be obtained in times small, compared to those associated with important changes of precipitation pattern. *Subject Headings:* **1. Radar calibration 2. Radar precipitation analysis 3. Radar measurement techniques.** —*Author's abstract.*

11H–76 551.501.81:551.509.312:551.577

Kessler, Edwin, III (*GRD, A F Camb. Res. Ctr.*), **Use of radar in kinematical studies of precipitating weather systems.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. A:1–9. 6 figs., table, 9 refs., 7 eqs. **DWB** (M01.81 R124pc, 1958)—The amount of water substance in a given volume can be judged from the strength of the radar echo returned from that volume. The occurrence and distribution of water substance in the atmosphere are largely given by the distribution of three dimensional winds. Use of radar echoes to indicate various features of three dimensional wind fields depends, then, on mapping three dimensional echo distributions and studying them in light of theories which take account of kinematic relationships between wind and water. This paper first describes the PAR-Scope, a radar oscilloscope display which facilitates quantitative mapping of radar reflectivity distributions. The PAR-Scope uses gated, averaged, echo amplitude information as one coordinate, and an element of position as the other coordinate. Its display, a profile of average reflectivity suggests the name. The PAR-Scope is operated with a scanning antenna and can be photographed simultaneously with the PPI or RHI display. Secondly, this paper gives the results of a study of the equation of continuity for water substance. The conclusions so far ascertained are mostly applicable to centers of regions of widespread, horizontally uniform updrafts. The results constitute an explanation of general features of radar reflectivity profiles actually observed under these conditions. The basic features include strong downward increase of reflectivity in the middle atmosphere and relatively slight changes in the surface layer. Upper layers occur during the period before the precipitation rate at the ground is steady. The steady precipitation rate at ground level at centers of widespread precipitation may be significantly in excess of the amount of condensation over a unit cross section, particularly when precipitation particles fall at about the speeds of the updrafts and with little change of fall velocity during most of their growth, as is often the case with snow. *Subject Headings:* **1. Radar precipitation studies 2. Kinematic analysis 3. Radar oscilloscope.**—*Author's abstract.*

11H–77 551.515.21:551.501.81

Kessler, Edwin, III (*GRD, AF Camb. Res. Ctr.*), **Fields of motion and temperature in hurricanes as revealed by radar.** *Technical Conference on Hurricanes, Miami Beach, Fla., Nov. 19–22, 1958, Proceedings*, issued **1958(?).** Sec. C:9. (10 p.) 2 figs., 8 refs. **DWB** (M15.2 A512pr). Also issued in: *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. K:67–72. 8 refs., 3 eqs. **DWB** (M01.81 R124pc, 1958)—By measuring the elevation of the radar observed "bright band" or melting level, valuable inferences can be made regarding temperature distributions in a hurricane or other deep rain producing storm. Secondly, study of the horizontal motion of precipitation areas as seen on the radar plan position indicator, when coupled with elevation data from the RHI display, serves to determine the horizontal wind at various levels. Finally, three-dimensional distributions of radar reflectivity and their changes with time can be related under simplifying assumptions to outstanding features of the three-dimensional wind field. Examples are presented which illustrate the application of these principles to studies of hurricane structure, including the large scale fields of temperature and motion, and those pertaining to the spiral rain bands. *Subject Headings:* **1. Radar observation of hurricanes 2. Hurricane structure.**—*Author's abstract.*

11H–78 551.508.85:551.501.81

†Kessler, Edwin, III, **Theoretical analysis of the PAR-Scope: an oscilloscope display for weather radars.** *U. S. Air Force. Cambridge Research Center, Instrumentation for Geophysics and Astrophysics*, No. 12, July **1959.** 36 p. 8 figs. (incl. photos), 3 tables, 20 refs., 14 eqs. **DLC**—The PAR-Scope, an oscilloscope display for use with pulsed radars and fluctuating targets, uses gated averaged amplitude information as one coordinate and azimuth or elevation as the other coordinate; its display is a profile of the average reflectivity of the target for the radar waves. The PAR-Scope is operated with a scanning antenna permitting simultaneous operation with the Range-Height Indicator or Plan-Position display. Such combinations provide means for rapid three-dimensional quantitative mapping of average reflectivity in the vicinity of the radar, and should be of importance

in studies seeking to relate the distributions of radar weather echoes to the air motions. Theoretical analysis of PAR-Scope performance considers the response of the scanning system to spatial variations of average reflectivity and to the rapid fluctuations characteristic of weather echoes. It is shown that reflectivity distributions of major interest can be easily represented to an accuracy within 1 db of that implicit in the radar calibration. *Subject Headings:* **1. Radar echoes 2. Radar oscilloscope.**—*Author's abstract.*

11H–79 551.501.81:551.577.11:551.576.11(74)

Kessler, Edwin III and Atlas, David (*both, GRD, AF Camb. Res. Ctr.*), **Model precipitation distributions.** *Aero Space Engineering*, N. Y., 18(12):36–40, Dec. **1959.** 8 figs., 2 tables, 8 refs., 5 eqs. **DLC**—Theories relating precipitation and cloud to vertical motion in the atmosphere are discussed briefly, and vertical profiles of precipitation rate and precipitation and cloud water contents are presented as models of widespread precipitation. Observed average profiles of radar reflectivity in New England thunderstorms are also presented and related to their water contents. The derived quantities have application to the numerous applied problems in aeronautics and radar detection in which general estimates of the precipitation parameters are required. *Subject Headings:* **1. Precipitation distribution 2. Radar thunderstorm observation 3. New England.**—*Authors' abstract.*

11H–80 551.508.85:551.577

Kodaira, N. (*Met. Res. Inst.*), **Radar rainfall area integrator correcting the errors of path attenuation.** *Papers in Meteorology and Geophysics*, Tokyo, 6(1):1–4, May **1955.** 7 figs. (incl. photos), 2 refs., 2 eqs. **DWB**—A radar rainfall area integrator is designed so as to indicate total precipitation amounts directly from the radar echoes over one selected watershed. The errors due to attenuation by range and intervening rain are corrected by an analogue computer. *Subject Heading:* **1. Radar rainfall area integrator.**—*Author's abstract.*

11H–81 551.515.4:551.501.81(541.2)

Koteswaram, P. and De, A. C. (*both, Met. Office, Dum Dum Airport, Calcutta*), **Study of pre-monsoon thunderstorms over Gangetic West Bengal by radar.** *Indian Journal of Meteorology and Geophysics*, Delhi, 10(3):275–282, July **1959.** 4 figs., 2 tables, 3 refs. **DWB, DLC**—By a study of hourly traces of PPI scope presentations on a Decca Type 41 Radar during pre-monsoon seasons of 1955–57, the directions of movement of thunderstorm sequences over Gangetic West Bengal were determined. Apart from the most predominant movement from NW/N, there were thunderstorms which moved from even SE, S or SW, though such cases were rare. The wind direction in NW'ly squalls was generally same as the direction of movement of the squall lines though squalls from other directions were also recorded sometimes. Vertical currents in the thunderstorm cells were studied by scanning with radar at different elevation angles and some of the observations are presented. *Subject Headings:* **1. Premonsoon storms 2. Radar observation of thunderstorms 3. West Bengal, India.**—*Authors' abstract.*

11H–82 551.501.81:551.553:598.2:591.174

Lack, David (*Edward Grey Institute of Field Ornithology, Oxford*), **Migrational drift of birds plotted by radar.** *Nature*, London, 182(4630):221–223, July 26, **1958.** 3 tables, 8 refs. **DWB**—Wind-speed and direction on the continent of Europe were studied, in particular in relation to the volume of bird migration. The radar records for most days and nights during March 15–April 21, 1956, Feb. 24–April 20, 1957 and March 29–April 18, 1958 show the wind speeds at the surface and the number of days on which migration was small (44 days) or large (70 days) after dark, as compared with 70 days on which migration was small or none, and 35 days when it was large after dawn. Other details are tabulated. *Subject Heading:* **1. Radar bird flight observations.**—*N.N.*

11H–83 551.501.81:551.594.5

Leadabrand, R. L.; Presnell, R. I.; Berg, M. R. and Dyce, R. B. (*all, Stanford Res. Inst., Menlo Park, Calif.*), **Doppler investigations of the radar aurora at 400 Mc.** *Journal of Geophysical Research*, Wash., D. C., 64(9):1197–1203, Sept. **1959.** 9 figs., 11 refs. **DLC**—By means of a relatively sensitive 400-Mc radar located at College, Alaska, the variation of Doppler shift of auroral echoes has been determined as a function of the following parameters: (1) azimuth angle of the radar ray; (2) off-perpendicular intersection angle of the radar ray and the earth's magnetic field; (3) elevation angle of the radar ray; (4) range of the echoes; (5) altitude of the reflection centers; (6) time of day; (7) number of occurrences; (8) strength of the echoes. These data have been further delineated in terms of the type of echo seen (discrete or diffuse) and whether the data were taken before or after magnetic midnight. An estimate of the spectrum spread of auroral echoes has also been determined by pulse and by CW techniques. A consistent trend in these data has been found which would indicate an east-west motion of the ionospheric irregularities. There is no appreciable variation in the direction of motion with time of day or with respect to magnetic midnight. The mean velocity

of the east-west motion appears to be 500 m/sec. These conclusions agree with those of KIM and CURRIE (1958) but disagree with those of LYON and KAVADAS (1958), NICHOLS (1957), and BULLOUGH et al. (1957). *Subject Headings:* **1. Radar echoes from auroras 2. Doppler displacement of auroral echoes.**—*Authors' abstract.* Ⓢ

11H–84 551.501.776:551.508.85

Leasure, Richard B. and Thompson, G. A., **Flight test results of cloud base and top indicator, AN APQ-39 (XA-1).** *U. S. Wright Air Development Center, WADC Technical Report,* 53-398, Sept. **1953.** 64 p. 26 figs., 10 graphs. Photostat of typescript. **DWB** (M01.81 U589fl)—Design features and flight tests of an airborne radar set which was developed specifically to detect and to record permanently a cross-sectional view of hydrometeorological phenomena, immediately above and below an aircraft in flight, are described. Tests were conducted in an area which lay within a 400 mi radius of Dayton, Ohio, during the period from November 1951 to June 1953. A series of flights was conducted during which the ground tract of the aircraft was planned so as to intercept the greatest variety of hydrometeorological phenomena. On each flight, correlation between the radar data obtained and the actual prevailing meteorological condition was made possible through the use of the report made by the meteorologist aboard the aircraft. The meteorologist was aided in his weather observations by periodic reports from ground stations along the tract. Results obtained from the flight tests reported herein indicate that only those hydrometeors which were associated with clouds having visible virga or precipitation were consistently detected and recorded. In addition, the tests indicated that the sampling method for obtaining necessary video bandwidth compression for use with facsimile recording resulted in an appreciable loss of information as compared to the information available from a film strip recording which was made at the same time. *Subject Headings:* **1. Cloud observation from airplanes 2. Air-borne weather radar.**—*Authors' abstract.*

11H–85 551.501.81:551.577.21:551.577.37(766)

Leber, Gail W. (*W. B. Airport Station, Oklahoma City*), **Isohyetals based on radar observations for the heavy rains in North-Central Oklahoma, May 15, 1957.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings,* issued **1958.** Sec. H:26–32. 5 figs. **DWB** (M01.81 R124pc, 1958)—Heavy rains of 5 to 20 in. occurred over a 400 sq mi area in north-central Oklahoma during the afternoon and night of May 15, 1957. Isohyetals were drawn, based on the radar observations and three rainfall reports in this 400 sq mi area during a 10 hr period. Subsequent detailed investigation of the rainfall in the area showed the relationship of the isohyetals in the areal extent and persistence presented by the radar echoes. *Subject Headings:* **1. Isohyetal charts 2. Radar analysis of Precipitation 3. North-central Oklahoma.**—*Author's abstract.*

11H–86 551.501.81:551.508.59:551.551

Lees, Sidney and Batteau, D. W., **Turbulence measurements at high altitudes.** Instrument Engineering Research, Cambridge, Mass., Contract DA-36-039-sc-78129, First Quarterly Report, July 1-Sept. 30, **1958.** 34 p. illus. **DWB** (M51 I59tu)—The use of 2 airborne targets to measure wind shear was investigated. The modulation produced by the interference of signals from the targets by radar reflection or by direct (radiosonde) emission was used. The mathematical relationships between targets and receivers for the inference of spacing by modulation measurement is treated in detail. Results show that each Cartesian coordinate of the separation vector for 2 targets can be derived from the measurement of phase relationship of interference modulation at each of an array of 4 receivers. The expression for wind shear from the measurement of the times of modulation zero crossings is given. Two proposed experiments for the initial practical tests of the theory are discussed. The first test involves 2 reflector carrying balloons or passive targets and a pulse ranging radar as a source of illumination, plus 1 additional receiver. The second test involves 2 radiosonde carrying balloons and 2 sets of receiving equipment adapted to the test. *Subject Heading:* **1. Radar turbulence meters.**—*TAB abstract.*

11H–87 551.501.81

Legg, T. H. (*Stormy Wea. Group, McGill Univ.*), **Radar weather patterns in stepped grey-scale.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings,* issued **1958.** Sec. F:37–40. 3 figs., 2 refs. **DWB** (M01.81 R124pc, 1958)—Typical weather radars can display only a small range of echo intensities for a given setting of the receiver gain control. The dynamic range can be extended by stepping this gain control, or alternatively by using a logarithmic I.F. amplifier. We are developing a system in which a logarithmic I.F. amplifier is followed by a flexible video shaping amplifier, so as to have a large range of echo intensities displayed as a chosen set of grey tones on the displaying device. The shaping amplifier can be switched to have either a continuous or a stepped characteristic. With good distance correction, and the shaping amplifier in the "stepped" condition, each of the several discrete shades of grey on the display represent a

quantitative, but fully adjustable, series of echo intensities. Should the steps in this picture become diffuse, the display takes on a continuous-scale quality that is entirely acceptable. *Subject Headings:* **1. Radar echo patterns 2. Radar range.**—*Author's abstract.*

11H–88 551.508.85:551.501.81:551.594.5

Leonard, Robert S., **A low power VHF radar for auroral research.** *Institute of Radio Engineers, N. Y., Proceedings,* 46(2):320–322, Feb. **1959.** 3 figs. (incl. photos), 2 refs. **DLC**—A 5-kw, 41-Mc radar which was designed for use in the U. S. IGY program is described. The standard operating procedures are outlined and a sample of the records is shown. The design of a scaling machine is discussed and a method of utilizing the scaled data to produce an auroral echo activity index is described. *Subject Headings:* **1. Radar echoes from auroras 2. Radar equipment.**—*Author's summary.* Ⓢ

11H–89 551.501.81:551.577

Lhermitte, Roger M. (*Obs. de Magny-les-Hameaux, Seine et Oise, France*), **Echo fluctuations study with zenith pointing radar.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings,* issued **1958.** Sec. B:25–28. 3 figs. **DWB** (M01.81 R124pc, 1958)—The fluctuations of the precipitation echoes which are obtained with a zenith pointing radar are studied in order to determine the nature of the scattering particles. Two different situations are presented showing two different precipitation processes. *Subject Headings:* **1. Radar precipitation echoes 2. Zenith pointing radar.**—*Author's abstract.*

11H–90 551.577.1:551.574.1:551.501.81

Lhermitte, Roger, **L'observation et l'étude des échos des précipitations, Première partie, Les bases théoriques et physiques de l'interprétation des échos.** [Observation and study of precipitation echoes, Pt. 1, Theoretical and physical grounds of echoes interpretation.] *France. Météorologie Nationale, Mémorial,* No. 46, **1959.** 31 p. 9 figs., 3 tables, 17 refs., 67 eqs. **DWB, DLC**—General statement describing the physical mechanism of echo formation and the theoretical relationships derived therefrom. Recall of the principal theoretical and physical notions at the basis of precipitation echoes studied tended to give to the echo a quantitative expression of its intensity, or of certain of its peculiarities. The results of these computations are at the basis of the experimental data interpretation, from which one can also determine the presence, number, and nature of the particles composing the precipitations. Pt. I concerns scattering and absorption of centimetric waves by hydrometeors, general reflexions on the shape and nature of particles, parameter $p = 2na/\lambda$ (a = radius of the particles and λ = wave length) and its limits, and the dielectric constant. Mie's theory relating to electromagnetic energy scattering through a spherical particle or an ellipsoidal particle is treated in Pt. 2. The application of Mie's theory, in the case of scattering through a partially melting ice-sphere or through complex geometrical shaped particles, is considered. The last two parts treat with the real case of an echo, due to the presence of a large number of particles contributing to the signal by separately scattering the energy. The intensity valuation of the signal requires the introduction of hypotheses which are not evident (Rayleigh's theory—random distribution of the particles). The form of the theoretical expressions which apply to a raindrop introduces a proportion between the echo intensity and a high power of its diameter, which renders comparisons with classical measurements of rain intensity difficult to establish. The author recalls the classical diffusion theories, the conception of the diffusing volume defined through the parameters of the radar apparatus, and examines in detail the incidences of the presence of a large number of particles in continuous motion on the echo fluctuation. He gives a survey of the methods used in order to obtain and to explain the results. *Subject Headings:* **1. Radar precipitation echoes 2. Mie scattering 3. Rayleigh scattering 4. Radio wave absorption 5. Radio wave scattering.**—*A.V.*

11H–91 551.501.81:551.577(44)

Lhermitte, Roger, **Sur le calcul du spectre de fluctuation d'un écho de pluie.** [Computing the fluctuation spectrum of a precipitation echo.] *Académie des Sciences, Paris, Comptes Rendus,* 248(13):2026–2028, April 1, **1959.** fig., 2 refs. **DWB, DLC**—Author presents a method for theoretical computation of the spectrum of fluctuation frequencies of a precipitation echo, based on data relating to the drops at the origin of this echo (number per unit of volume). An example is given of comparison between the spectrum computed through this method and the experimental spectrum obtained by applying the corresponding signal to a special frequency analyzer. *Subject Headings:* **1. Radar precipitation echoes 2. Magny-les-Hameaux, France.**—*A.V.*

11H–92 551.501.81:551.578.11

Lhermitte, Roger, **La mesure absolue des vitesses de chute de particules précipitantes à l'aide d'un radar.** [The absolute measurement of raindrop velocity by means of a radar.] *Académie des Sciences, Paris, Comptes Rendus,* 249(19):1923–1925, Nov. 9, **1959.** fig., 2 refs. **DWB, DLC**—Statement of an experimental method for the indirect measurement of the distribution of fall speeds

of particles detected by a fixed vertical beam radar apparatus. This method is principally based on interpreting the fluctuation spectrum of a signal resulting from the mixing of the investigated rain echo with a terrestrial echo located at the same distance. The author expounds two examples. The former concerns gentle rain: a spectral layer extends to 7.5 m/s with a maximum at 5 m/s. In the latter example relating to particles, ice crystals or snow flakes, detected at high altitude the curve does not expand beyond 2 m/s and presents the maximum at about 1 m/s. *Subject Headings:* **1. Radar echos from rain 2. Raindrop velocity measurement techniques.**—*A.V.*

11H–93 551.501.81:551.515.2:551.577

†Ligda, Myron, G. H., **Analysis of motion of small precipitation areas and bands in the hurricane Aug. 23–28, 1949.** Massachusetts Inst. of Technology. Dept. of Meteorology. Weather Radar Research, Contract DA-36-039 SC-64472, Technical Note, No. 3, May **1955.** 41 p. 19 figs., 15 refs. **DWB** (M01.81 M414te).—This analysis is based upon the unsurpassed motion picture of the hurricane which was taken at the Univ. of Florida, College of Engineering. The film was taken at 30 sec intervals over 18 hrs featuring the PPI displays of a SCR-B radar. The author made thirty vector patterns, each vector length representing the circulatory movement of the small precipitation areas, whose characteristics are discussed at some length. The findings indicate a relatively consistent difference between small precipitation area and surface wind velocity and direction, the latter about 45°. Consideration of the banded structure includes the inner and the outer bands. It is tentatively stated that the cause of this spiral structure may be a microfrontal or perhaps a squall line phenomenon. Excellent PPI displays and graphical presentation of their details are given. *Subject Headings:* **1. Hurricane precipitation 2. Radar hurricane photographs.**—*W.N.*

11H–94 551.501.81:551.515.8(777)

Ligda, Myron, G. H. (*Dept. Oceanog. & Met., Texas A. & M. College*), **The radar observation of mature prefrontal squall lines in the Midwestern United States.** *Texas Agricultural and Mechanical College. Dept. of Meteorology and Oceanography, Oceanography and Meteorology Series*, No. 70, **1956.** 3 photos. **DWB.** Reprinted in *Texas. A. and M. College. Dept. of Oceanog. and Met., Contributions in Oceanography and Meteorology*, 3(60–89):153–155, 1955–1957. Issued **1958. DWB**—An unsuspected micro-scale circulation pattern in prefrontal squall lines has been located by powerful 10- and 23-cm wave length radar stations in the Midwestern U. S. A description of the pattern is contained in this report. It discusses the interesting features of the precipitation echo pattern, the banded echo, the precipitation-free zone, the cellular structure in the thunderstorm belt, the light precipitation zone in the rear of the storm, and the electrical activity. The systems described in this report are not chance configurations but evidence of fundamental properties of prefrontal squall lines. *Subject Headings:* **1. Radar observation of squall lines 2. Prefrontal squall lines 3. Midwest United States.**—*N.N.*

11H–95 551.501.81:598.2:591.174

Ligda, Myron G. H., **Radar observations of blackbird flights.** *Texas Journal of Science*, 10(3):255–265, Sept. **1958.** 4 figs., table, 5 refs.—The peculiar radar echoes resembling ripples in water as observed with a 23 cm λ AN/FPS-3 radar were tentatively explained by C. Elder as resulting from downward beam refraction as a function of atmospheric gravity waves from localized disturbance of low-level temperature inversions. Somewhat similar echoes observed at Texarkana are discussed and illustrated for comparison. It is concluded that the latter observation is fully explainable as echoes caused by blackbirds. A paper devoted to the behavior of these birds is included for support of the explanation given. *Subject Headings:* **1. Radar bird flight observations 2. Texarkana, Ark.**—*W.N.*

11H–96 551.501.81:551.577

Ligda, Myron G. H. (*Stanford Res. Inst., Calif.*), **The use of color in precipitation echo analysis.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. H:43–50. 5 refs. **DWB** (M01.81 R124pc, 1958).—In radarscope interpretation and display of the temporal and spatial variations of precipitation echoes, polychromatic indicators offer many attractive features. A number of ways in which such displays can be made are discussed. The various parameters of the radar weather observation are listed and the employment of color in their presentation considered. It is concluded that color displays have several operational applications and could give observers considerable assistance in determination of precipitation echo motion, nature of echoes, and regions of storm intensification and dissipation. *Subject Headings:* **1. Radar analysis of precipitation 2. Radar spectra.**—*Author's abstract.*

11H–97 551.501.8:551.509.311

Ligda, Myron G. H. (*Stanford Res. Inst., Calif.*) and Watanabe, Kazuo (*Japan Met. Agency, Japan*), **The use of radar-network observations in synoptic-scale weather analysis and intermediate-**

range forecasting. *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings,* issued **1958.** Sec. H:38–42. 4 refs. **DWB** (M01.81 R124pc, 1958)—In anticipation of the time when weather radars across the U. S. will be organized into networks allowing rapid exchange and collection of observations, studies have been in progress during recent years to develop techniques for the utilization of the information in meteorological analysis and forecasting. Results of these studies show that the radar observations can be of appreciable assistance in two fundamentally different ways. First, composite, synoptic-scale radar observations can frequently improve the accuracy and comprehensiveness of regular surface and upper air weather analyses. Second (and sometimes more significantly), such radar observations play an essential role in hygrokinematic analysis, a newly developed method of weather prognostication based upon the movement of moist and dry regions of the atmosphere. While it is still too early to estimate the changes in short- and intermediate-range forecasting procedures which will take place when comprehensive large-scale radar observations become available to forecasters on a routine basis, it is probably safe to say that they will be both appreciable and appreciated. *Subject Headings:* **1. Radar synoptic analysis 2. Radar networks 3. Hygrokinematic analysis 4. Weather forecasting.**—*Authors' abstract.*

11H–98 551.508.85:551.501.81

Ligda, Myron G. H., **Radar—new weather eye.** *Stanford Research Institute, SRI Journal,* 3:49–55, **1959.** figs. **DWB, DLC**—A semipopular account stressing the importance of radar meteorology as a major tool for accurate weather plotting. Effects of the atmosphere on radar beams; detection by radar beam reflection of such tell-tale phenomena as "angels" and certain species of land and sea birds; the problems of troublesome refractive effects; detection by radar beam attenuation of atmospheric constituents such as water vapor, rain and hail; natural emanations at radar frequencies of radio stars, sun, lightning and aurora; and suggestions for a model experimental station are presented together with photographs and hand-drawings. *Subject Headings:* **1. Radar meteorology 2. Radar weather installations.**—*R.P.*

11H–99 551.501.8:551.510.62

Luckenback, Guenther, **Two examples of non-precipitating echoes as observed on AN/CPS-9 Radar.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings,* issued **1958.** Sec. D:41–47. 11 figs., table, 5 refs. **DWB** (M01.81 R124pc, 1958)—Examples of nonprecipitating radar echoes in the East Texas region are presented. The "First Wind-Gust Line" and the "Cumulus Intrusion" of a stratified angel-echo are considered briefly. Some of the meteorological conditions accompanying these echoes are reviewed. *Subject Heading:* **1. Radar angels.**—*Author's abstract.*

11H–100 551.508.85

Luftman, Alvin S. (*Raytheon Manufacturing Co.*), **A survey of recording storage tube types.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17 20, 1958, Proceedings,* issued **1958.** Sec. F:21–28. 9 figs. **DWB** (M01.81 R124pc, 1958)—The basic principle of Recording Storage Tubes, the use of transmission modulation by means of a stored charge, is described briefly. From an understanding of the principles involved, it can be seen that recording tubes are capable of up to 20,000 read-outs without excessive deterioration and so a stored picture can be displayed for several minutes. The Recording Storage Tube types presently available include a single-gun tube with magnetic deflection and focusing capable of 600 lines resolution, a single-gun tube with electrostatic focusing capable of better than 1000 lines resolution, and a dual-gun tube with magnetic deflection and electrostatic focusing at both ends, with better than 600 lines resolution. All three tube types have a continuous dynamic range and can be used as integrating devices or for scan-conversion. The dual-gun tube, in particular, can be readily used to convert PPI information into a TV scan or into slowed-down video. (*Same item as* 11.4–258, April, 1960, *Met. Abs.*) *Subject Headings:* **1. Radar weather storage tubes 2. Radar data.**—*Author's abstract.*

11H–101 551.501.81:551.594.5

†Lyon, G. F. and Kavadas, A., **Horizontal motions in radar echoes from aurora.** *Canadian Journal of Physics,* Ottawa, 36(12):1661–1671, Dec. **1958.** 8 figs. (incl. photo), 18 refs. **DWB, DLC**—A systematic motion of 48.2 Mc/sec echoes associated with aurora is found at Saskatoon. The motion is towards the west before midnight and towards the east after midnight, the mean velocity in either direction showing a statistical relation to variations in the earth's magnetic field. No correlation is found between individual echo velocity and magnetic disturbance, and no period of zero velocity is observed. There is also evidence of an ordered relation between motion in the north-south direction and disturbances in the earth's magnetic field. *Subject Headings:* **1. Radar echoes from auroras 2. Saskatoon, Canada.**—*Authors' abstract.*

11H–102 551.501.81:551.577

†McGill Univ. MacDonald Physics Laboratory, **Activities of the Stormy Weather Group, April 1950 to March 1957.** Contract AF 19(122)-217, Final Report, **1957.** 118 p. figs. (incl. photos), tables, eqs., 64 refs.—The Canadian Army Operational Research Group received financial support from the Geophysical Research Directorate during the period April 1950 to March 1957 for stormy weather investigations. A detailed discussion of the scientific contributions during that period is included in this report. These cover: (1) the physical basis of weather radar, (2) size distribution of precipitation particles, (3) cloud physics, (4) the development of the "CAPI" display and (5) the pattern of falling snow. Implications for some future work on radar, snow and rain are considered. *Subject Headings:* **1. Stormy Weather Research Group 2. Radar precipitation observation 3. Canada.**—*N.N.*

11H–103 551.501.81:551.557

Malinovski, Al., **Vŭrkhu metodite za izmervane na visokiia viatŭr posredstvom radiolokatsionna uredba.** [Measurement of upper-air wind by radar.] *Khidrologiia i Meteorologiia*, Sofia, No. 6:53–63, **1958.** 7 figs., 6 tables, 5 eqs. Russian and English summaries p. 62–63. **DLC**—The reflector and transponder methods of wind measurement by radar are discussed. Certain characteristic data on various types of reflecting surfaces and angular reflectors are given and the maximum ranges of tracing are calculated, depending on wavelength. Taking into consideration fading and diffusion of radio waves due to water drops, conclusions are reached concerning the most suitable working wavelength with a view to obtaining data on upper air wind. The necessary power for covering a distance of 150 km is calculated for work with transponders. Minimum power requirements of radar transmitters are indicated as well as method of operation (with transponder or reflector) depending on wave length. *Subject Headings:* **1. Radar upper air wind measurement techniques 2. Transponders.**—*Author's abstract.*

11H–104 551.508.85:551.501.81(432.1)

Malkowski, G. (*Berlin*), **Betriebserfahrungen mit dem Berliner Wetter-Radargerät.** [Operational experiences with the Berlin weather radar set.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 10(4):355–356, **1958.** 3 figs., 3 refs., 2 eqs. German, English and French summaries p. 355. **DWB, DLC**—First experiences of operation of a weather radar station applied by the Free University of Berlin since July 1957 are communicated. *Subject Headings:* **1. Weather radar installations 2. Berlin, Germany.**—*Author's abstract.*

11H–105 551.501.81:551.510.53:551.594.12

Marmo, F. F.; Aschenbrand, L. M. and Pressman, J. (*all, Geophys. Corp. America, Boston*), **Artificial electron clouds, Pt. 1, Summary report on the creation of artificial electron clouds in the upper atmosphere.** *Planetary and Space Science*, N. Y., 1(3):227–237, Aug. **1959.** 2 figs., 4 tables, 3 refs. **DWB**—A systematic study has been initiated for the purpose of better understanding the problems associated with the creation of artificial electron clouds in the upper atmosphere. A series of eight rocket experiments has been performed whereby artificial electron clouds were produced between 70 km and 130 km. The ground-based detection networks that were employed are discussed, and included is a method of correlating both optical and radio-radar data. This affords a new dimension for propagation and upper atmospheric studies. This paper, the first of a series, is devoted to summarizing the overall concepts, methods and techniques, and operating procedures employed in this study. It includes tabulated summaries of the various optical and radio-radar detection data in addition to some scientific uses of artificial electron clouds. The subsequent papers of this series offer detailed discussion and conclusions pertaining to much of the data outlined here. *Subject Headings:* **1. Radar observation of artificial electron clouds 2. Artificial electron clouds.**—*Authors' abstract.* Ⓢ

11H–106 551.501.81:551.594.5

Martvel', F. E. and Pogorelov, V. I., **O sviazi svetimosti poliarnykh siianiĭ s radiolokatsionnymi otrazheniiami ot nikh.** [The relation between the brightness of auroras and their radar reflections.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 8:1052–1053, **1958.** 7 figs. **DLC.** Transl. into English in the corresponding issue of the English language ed. of the **Izvestiia,** *Bulletin of the Academy of Sciences of the USSR, Geophysics Ser.* **DWB**—In order to determine the relationship between auroras and auroral radar reflections, the authors compared motion picture frames coinciding in time with radar signals. The material used was that obtained at Roshchino ($\varphi = 60°12'$N; $\lambda = 29°34'$E; $\Phi = 56°35'$; $\Delta = 116°47'$E). An analysis of the material indicates the following: (1) although it is impossible to determine the form of auroral illumination that is most effective from the point of view of radar reflection, many of the most intense reflections are close to the most pronounced radiation forms; (2) reflections with large amplitude correspond to the brightest reflection regions of the auroras in the supposed zones of reflection of the auroras, and no radar reflections were observed when the

auroras were completely lacking; (3) during weak illumination radar reflections were rarely observed; (4) there were no instances in Roshchino when radar reflections preceded auroras; (5) there exist small differences (about 5–10°) between the azimuths of the most intense parts of the auroras in the supposed zones of reflection and the azimuths of the most intense radar reflections which, however, do not go beyond the limits of possible errors of observation and which may be explained by distortion of the trajectories of automagnetic waves in a medium of electronic inhomogeneities, which are considerable in the auroral regions; (6) the dimensions of the supposed zones of radar reflections are slight in comparison with the region of the heavens occupied by the auroras. *Subject Headings:* **1. Radar echoes from auroras 2. Radar reflection from auroras 3. Auroral luminescence 4. Roshchino, U.S.S.R.**—*I.L.D.*

11H–107 551.501.8:551.576.1 551.509.617

Mason, B. J. (*Imperial College, London, Univ.*), **Nuages à pluie.** [Raincloud.] *Shell Aviation News*, Paris, London, No. 242:2–6, Aug. **1958.** 10 figs. **DWB**—Succinct statement of the theory relating to the forming of rain and other forms of precipitation. The image made on a radar screen by a cloud system in layers, permits verification of whether or not the precipitation has its origin in the ice crystal process. The various peculiarities of radar echoes caused by different types of precipitation are given. Process of shower formation, and summary of the different experiments concerning artificial rain are included. Photos of clouds illustrate this article. *Subject Headings:* **1. Rain formation 2. Radar analysis of precipitation 3. Artificial precipitation.**—*A.V.*

11H–108 551.501.81:551.577.37

Muchnik, V. M., **Ob izmerenii intensivnosti osadkov lokatorom.** [Measurement of the intensity of precipitation by means of radar.] *Meteorologiia i Gidrologiia*, Leningrad, No. 7:50–54, July **1958. DWB, DLC**—The measurement of the intensity of precipitation by radar of centimeter range is based upon the fundamental radar equation $P=P_0K(z/r^2)$ where P = energy of returning signal; P_0 = energy of radiated signal; r = distance from radar to reflection object; K = a constant determined by parameters of the radar and $z=\sum N_i a_i^6$ = reflection capacity of precipitation (N_i = number of drops in an interval; $a_i+\Delta a$ in unit volume; a = diameter of drops). The intensity of precipitation, R, and z, are related by the equation $z=\beta R^\alpha$ where α and β are constant coefficients. On the basis of observations on the distribution of drops made in Kiev in the spring of 1948, the author attempts to find a relationship between z and R. From the distribution of drops, which infringed upon a moving paper strip covered with eosin, $z=\sum(N_i a_i^6/v_i)$ and $R=(\pi/6)\sum N_i a_i^3$; where v_i = velocity of the drops. For rainfall intensity between 0.2–1.8 mm/hr, the relationship $z=207R^{1.39}$ was obtained and the values of α and β were in close agreement with the published values for different geographical localities ($\alpha=1.44-1.60$ and $\beta=200-630$). The possibility of determining α from simultaneous observations on precipitation by storm warning radar with circular scope and with pluviographs is described. The formula for $\alpha=\dfrac{2\lg(r_2/r_1)}{\lg(R_2/R_1)}$ is obtained. Computed values of α for given precipitation intensities, data on rainfalls investigated, and graphs giving intensity of precipitation associated with distance of reflecting object as given on the radar screen, are presented. *Subject Heading:* **1. Radar rainfall intensity measurements.**—*I.L.D.*

11H–109 551.501.81:551.578.1(759,773)

Mueller, E. A. (*Illinois State Water Survey*), **Climatic variations in raindrop-size distributions.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. B:29–32. 2 tables, 2 refs. **DWB** (M01.81 R124pc, 1958)—Preliminary results are presented as to the differences and similarities of the raindrop-size distribution obtained in Coral Gables, Fla., and Champaign, Ill. In general, analysis of the distributions shows that, at the same rainfall rate, fewer but larger drops occur in Illinois than in Florida. Regression lines for correlation of rainfall rate with radar reflectivity, radar attenuation, and liquid water content are also presented. *Subject Headings:* **1. Raindrop size distribution 2. Radar attenuation 3. Coral Gables, Fla. 4. Champaign, Ill.**—*Author's abstract.*

11H–110 551.501.81:551.578.11

Mueller, E. A.; Stout, G. E. and Ackerman, William C. (*all, Ill. State Water Survey, Urbana, Ill.*), **Study of intensity of surface precipitation using radar instrumentation.** Illinois. State Water Survey. Meteorological Lab. at the Univ. of Illinois, Contract DA-36-639 SC-64723, Final Report, July 1, 1955–March 30, **1958.** 33 p. 5 figs., 7 tables. **DWB** (M01.81 I29i)—The results of the work performed under this contract are presented along with specific references to Quarterly Technical Reports in which details of the studies can be found. A total of 439 100-ft rolls of data film, representing 7033 hrs of operation of the CPS-9, have been collected during the contract period. Drop cameras were built and have been operated in Illinois, Florida, and Oregon. Only a small part of the drop data has been analyzed. A successful range squared correction circuit for use with the CPS-9

was constructed and tested. The area integrator was evaluated. Summary results of the following studies are presented: various methods of determining quantitative measurements of rainfall by radar; CPS-9 capabilities in the detection of point and areal mean rainfall; scope interpretations of hail, ghosts, and the differentiation between rainshowers and thundershowers; attenuation compensation; spatial drop-size distribution; and preliminary drop-size distribution for tropical rains of Miami, Fla. *Subject Headings:* **1. Radar precipitation measurement 2. Radar scope photography.**—*Authors' abstract.*

11H–111 551.501.81:598.2

Mueller, E. A. (*Illinois State Water Survey*), **Radar observations of unusual echoes.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. D:17–21. fig., ref. **DWB** (M01.81 R124pc, 1958)—Two unusual echoes were noted using the CPS-9 radar. On one occasion a large area to the southwest of the radar showed a strong return over a large area. An airplane was dispatched to the area in which the return was noted. No visible cause was found. However, a strong temperature inversion was noted. The echo was tracked for one and a half hours. On another occasion the CPS-9 was used experimentally to determine whether the migration of ducks could be monitored using a CPS-9. This appears feasible as the ducks could be tracked to distances of at least 12 mi from the radar set. *Subject Heading:* **1. Radar echoes from birds.**—*Author's abstract.*

11H–112 551.501.81:551.510.62

Newell, Reginald E. (*M. I. T.*), **Intensity measurements on angels at 3 and 10 cm.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. E:50–56. fig., table, 7 refs., 3 eqs. **DWB** (M01.81 R124pc, 1958)—On several occasions received power measurements at both 3 cm and 10 cm have been obtained from radar angels. The two radars were calibrated with appropriate signal generators and losses were evaluated. A calibration of relative received power was performed on rain at both wavelengths. It has been found that the ratio of the volume reflectivities at 3 cm and 10 cm is smaller for angel echoes than for rain echoes. The difference is too large to be attributed to the experimental errors. The volume reflectivity interpretation is preferred over the power reflection coefficient approach as RHI and PPI photographs showed the echoes to be present over many pulse lengths. The data are pertinent to estimates of refractive index gradients is the lower troposphere. *Subject Headings:* **1. Radar angels 2. Radar signal intensities.**—*Author's abstract.*

11H–113 551.501.81:551.578.11:531.52

Newell, Reginald E. (*Wea. Radar Res., M. I. T.*), **A comparison of solid hydrometeor shape at wavelengths of 3 CM and 5000 A.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. B:1–7. 4 figs., 8 refs. **DWB** (M01.81 R124pc, 1958)—In polarization work it has been difficult to compare estimated shapes from radar data with actual hydrometeor shapes within the scattering volume. On the occasion to be discussed, Nature was kind enough to freeze the drops in our scattering volume and preserve them long enough for photography at the surface directly beneath. From the photographs of frozen non-spherical raindrops, cancellation values were computed and found to be between −6.5 and −8.0 db. Radar measurements had given values of −7.0 db. The agreement argues well for the use of such techniques in non-spherical hail detection. New England storms do not provide the opportunity, however, for an adequate test of hail detection via cancellation with our radar. *Subject Headings:* **1. Radar hydrometeor shapes 2. Raindrop photographs 3. Raindrop shapes 4. Radar observation of hail.**—*Author's abstract.*

11H–114 551.501.81:551.515:551.558.1

†Newell, Reginald E., **Some radar observations of tropospheric cellular convection.** Massachusetts Institute of Technology. Dept. of Meteorology, Contract AF 19(604)-2291 (Weather Radar Research), Research Report No. 33, Nov. **1959.** 53 p. 15 figs., 66 refs., 26 eqs.—Small-scale cellular convection is a mode of motion whose role in the vertical transport processes in the troposphere is not yet properly established. With the object of providing some basic information necessary to assess this role, the dimensions of cellular convective motions are obtained from a range-height display of an AN/CPS-9 3-cm radar together with estimates of the frequency of cellular versus non-cellular echoes. The observation of cell spacing and depth, for cells which do not exceed about 6 km in depth, vary in a manner which is similar to that predicted from the Bénard cell theory of RAYLEIGH. The correspondence suggests that the motions may be transporting heat upwards. Other properties are doubtless simultaneously transported vertically; as an example, some estimates are made of the vertical flux of horizontal momentum at the radar site (42°N). *Subject Headings:* **1. Convective cells 2. Bénard cells 3. Radar observation of convective clouds.**—*Author's abstract.*

11H–115 551.507.321:551.508.85

Nickerson, B. A., **Development of a pre-assembled radar-reflective balloon.** *American Meteorological Society, Bulletin*, 39(12):659, Dec. **1958.** 2 figs. **DWB, DLC**—The Weather Bureau and U. S. Navy Bureau of Aeronautics have shown much interest in the development of a method of manufacturing ready-to-use radar reflective balloons. The method described has been developed by the Dewey and Almy Chemical Division, W. R. Grace & Co., Cambridge, Mass. The corporation is working under a U. S. Navy Bureau of Aeronautics contract. Illustrations show balloons coated on the outside with radar-reflective aluminum dipoles; as the balloon expands the target enlarges. Five of these balloons were tested at NRL-Chesapeake Bay annex, and 25 more manufactured for the Navy. *Subject Heading:* **1. Radar reflective balloons.**—*N.N.*

11H–116 551.501.81:551.577

Noel, Thomas M. and Fleisher, Aaron (*both, Dept. of Met., M. I. T.*), **Some linear estimates of the predictability of precipitation.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. J:8-13. 5 figs., 4 refs. **DWB** (M01.81 R124pc, 1958)—The practical use of an AN/CPS-9 radar instrument is described here when the representative data concern the plane distributions of signal intensity recorded at 10 min intervals over a 60 m radius. *Subject Headings:* **1. Radar precipitation echoes 2. Precipitation forecasting.**—*W.N.*

11H–117 551.501.81:551.515.3

Nolen, Robert H. (*U. S. W. B., Kansas City, Mo.*), **A radar pattern associated with tornadoes.** *American Meteorological Society, Bulletin*, 40(6):277–279, June **1959.** 3 figs. **DWB, DLC**—Radarscope patterns at the time of known tornado occurrences were examined. There seems to be a good correlation between tornadoes and an echo pattern called a LEWP (Line Echo Wave Pattern). Many of these LEWP's were observed without reports of tornadoes or large hail. In about 75% of the confirmed cases of tornadoes, their occurrence could be associated with a line of echoes. Individual echo trajectory convergence predominated in the remainder of cases. *Subject Headings:* **1. Radar tornado detection 2. Tornado location.**—*Author's abstract.*

11H–118 551.510.62:551.501.81

†Plank, Vernon G., **Spurious echoes on radar: a survey.** *U. S. Air Force, Cambridge Research Center. Geophysical Research Papers*, No. 62, May **1959.** 51 p. 14 figs. (incl. photos), 2 tables, 126 refs. **DWB, DLC**—Radar echoes that are received from a sensibly clear atmosphere are commonly called "angels." In this paper the various types are described and the probable causes discussed. Also considered is the nature of signals from extraterrestrial sources. *Subject Heading:* **1. Radar angels.**—*Author's abstract.* Ⓢ

11H–119 551.501.81:551.594.5

*Presnell, R. I.; Leadabrand, R. L.; Peterson, A. M. et al. (*all, Stanford Res. Inst., Menlo Park, Calif.*), **VHF and UHF radar observations of the aurora at College, Alaska.** *Journal of Geophysical Research*, Wash., D. C., 64(9):1179–1190, Sept. **1959.** 13 figs., 6 tables, 14 refs. **DLC**—During routine UHF auroral radar investigations an unusual daytime auroral effect has been discovered. It apparently occurs most frequently when: (1) the reflecting region is sunlit; (2) the atmosphere is undergoing its greatest change (early morning and late afternoon). There is a minimum of echo occurrence at noon when atmospheric conditions are stable. Daytime aurora is distributed over a larger region of space than the more commonly observed nighttime aurora. The nighttime and daytime echoes are labeled discrete and diffuse, respectively. They can be differentiated in several ways. Discrete echoes are identified by their relatively short duration, their occurrence only at night, and their orientation in the E layer along a plane at right angles to radar beam; hence, the echo does not shift in range with change in elevation angle of the radar antenna. Diffuse echoes last longer, occur only during the day, and are apparently oriented in the E layer along a plane almost parallel to the surface of the earth; hence, the echo does shift in range when the radar-antenna elevation angle is changed. The primary effects of increasing the observation frequency are decreasing echo amplitudes and decreasing maximum off-perpendicular angle. The observed aspect sensitivity and the wave length dependence are interpreted in terms of the scattering approach of Booker. Using the experimental UHF results, a model of the underdense ionosphere has been developed consisting of irregularities which have dimensions of 0.1 m across and 3.5 m along the magnetic field lines. The echo results are compared with auroral zone effects and described, together with measurements of the frequency spectra (Doppler shift and spread) of an aurorally reflected continuous-wave signal. *Subject Headings:* **1. Radar observation of auroras 2. Daylight auroras. I. Dyce, R. B. II. Schlobohm, J. C. III. Berg, M. R.**—*Authors' abstract.* Ⓢ

11H–120 523.164.8

Price, R.; Green, P. E.; Goblick, T. G. et al., **Radar echoes from Venus.** *Science*, Wash., D. C., 129(3351):751–753, March 20, **1959.** fig., table, 8 refs. **DLC**—It is possible to obtain radar echoes

from celestial bodies outside the Earth-Moon neighborhood. Scientific evaluation of such i formation has engendered the present experimental investigation conducted on Feb. 10th and 12t 1958, about 2 weeks after Venus' closest approach to the Earth. In order to collect the data, fi separate runs were made. Four of these have been processed and summarized. Two of the fo were successful and the over-all results are given. *Subject Headings:* **1. Radar echoes from Venu I. Kingston, R. H. II. Kraft, L. G., Jr. III. Pettengill, G. H. IV. Silver, R. V. Smith, W.** —*N.N.* Ⓢ

11H–121 551.501.81:551.594

Pogorelov, V. I., **Radiolokatsionnye otrazheniia ot poliarnykh siianiĭ.** [Radar reflections fro auroras.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 8:1048–1051, **1958.** 4 figs., 6 ref **DLC.** Transl. into English in the corresponding issue of the English language ed. of the **Izvestii** *Bulletin of the Academy of Sciences of the USSR, Geophysics Ser.* **DWB**—In connection with th IGY program radar studies on the aurora are being carried out at Roshchino ($\varphi = 60°12'$; $\lambda = 29°34'$ $\phi = 56°35'$; $\Delta = 116°47'$E). The radar installation is described briefly. Two types of signals we observed on the screen of the electron tube indicator during an aurora; one type (a) was eith stationary or moving very slowly and the other type (b) moved rapidly, both with increasing an diminishing distance. An examination of the distribution of both types of signals, at hourly interva according to local time, shows that the time of maximum number of reflections and their maximu intensity coincide, and that weak signals were found to occur only at the time corresponding to tha of maximum occurrence. With rare exceptions the variations in intensity with time of day similar in both types of signals. The maximum reflection of both types of signals occur along th azimuth at 0° and 20°. It is possible that the small minimum along the azimuth near 10° is a resu of random deviation and it may disappear when more extensive material is analyzed. The mea position of azimuths, from which signals of different type issue, are often similar. Signals of typ "b" are sometimes either similar to or are mirror images of type "a" signals. The coincidence azimuths indicates that sometimes both types of radar reflections originate in similar regions wit increased electron density. It is shown by means of a graph that the areas of reflection of signa are not located upon a narrow arc along a magnetic parallel, although fundamentally they are co centrated close to it. The arc-like distribution coincides with the magnetic but not geomagnet parallel. The measurement of the height of the radar reflection at Roshchino in 1957 indicates tha the maximum number of reflections was at a height of 120 km, i.e., primarily at the zone of di tribution of the most intense regions of auroral illumination. When the magnetic field is replac by the geomagnetic field another distribution is obtained. But the maximum number of reflectio does not come from the azimuth coinciding with the plane of the geomagnetic meridian. *Subje Headings:* **1. Radar reflection from auroras 2. IGY auroral program 3. Roshchino, U.S.S.R.** *I.L.D.*

11H–122 551.501.81:551.515

Radar performance in sand and dust storms. *Marine Observer*, London, 29(184):82, April 195 **DLC**—The Radio Research Station of the Department of Scientific and Industrial Research reporte that there is very little definite evidence concerning the effects of sand and dust storms on rad performance. However, there is good reason to believe that true sand storms can produce bo pronounced echoes and marked attenuation at 3 cm wavelength, whereas at the same wavelengt not much of an echo would be expected from dust, inasmuch as dust particles are much smaller tha sand particles. *Subject Heading:* **1. Radar performance in sand storms.**—*R.P.*

11H–123 551.508.8

Radar-sonde meteorological station at Crawley. *Nature*, London, 172(4375):440, Sept. 5, 195 **DWB**—Note on a system to measure winds up to 100,000 ft, and pressure, temperature and humidit if required. *Subject Heading:* **1. Radarsondes.**—*C.E.P.B.*

11H–124 551.501.81:551.510.62(547.

Rai, D. B. (*Met. Office, Santacruz*), **A preliminary study of 'angel' activity near Bombay.** *India Journal of Meteorology and Geophysics*, Delhi, 10(3):313–320, July **1959.** 6 figs., 2 tables, 5 ref **DWB, DLC**—During the period March–May 1958 some radar angels were observed on the PP display of weather radar based at Bombay. These echoes cannot possibly be attributed to t generally accepted Type III angel source, viz., reflection of radar waves from ground via atmospher layer or inhomogeneity. It is suggested that these are angels caused by direct partial reflectio from a horizontally stratified layer containing shear-gravity waves. *Subject Headings:* **1. Rad angels 2. Bombay, India.**—*Author's abstract.*

11H–125 551.501.81:551.509.6

Robert, G.; Lehoux, G. and Vitureau, P., **Expériences aériennes de pluie provoquée.** [Aeri experiments on artificial rain making.] *Académie des Sciences, Paris, Comptes Rendus*, 246(21

3091–3093, May 28, **1958. DLC**—Two kinds of experiments are described: a) experiments from the ground with smoke making engines, carriers of hygroscopic nuclei (silver iodide), and b) aerial experiments by planes with smoke making engines (with silver iodide or bombs with carbonic snow). After the first experiments it was not possible to conclude that rain resulted from cloud seeding. The second experiments were made on clouds without precipitation tendency and were followed by a 3.2 cm radar wave length. Echoes appeared and disappeared after relatively short intervals. *Subject Headings:* **1. Artificial precipitation 2. Radar precipitation echoes.**—*A.V.*

11H–126 551.501.81:551.576.1:551.577.37:551.553.21(545.5)

Roy, A. K. (*Nat'l Physical Lab., New Delhi*), **Certain aspects of monsoon rain in Northwest India, based on studies by microwave radar.** *Journal of Scientific and Industrial Research, Sec. A*, New Delhi, 18(9):422–425, Sept. **1959.** 3 photos, 4 refs. **DWB, DLC**—On a high power meteorological radar (peak output, 250 kw, wavelength, 3.2 cm) the echo characteristics of a number of cloud cells within 250 km around Delhi, at various stages of precipitation development, were studied during the monsoon season of 1958. The present paper reports: 1) relative incidence of rain from cold and warm clouds, and 2) how frequently rain initiation in clouds of the latter type is governed by ice crystal growth in their top layers. It is reported that, out of 275 rain cells studied, 183 gave precipitation echo originating from cold clouds and the other 92 from warm clouds. On further examination of the 130 cold cloud cells, 94 showed a well-defined bright band just below the freezing height, a feature which is suggestive of melting snow flakes aiding the process of rain, and the remaining 36 did not. Thus the major contribution of monsoon rain in and around Delhi comes from cold clouds, which show melting band feature, suggesting that ice crystal process apparently plays a notable part in rain development during monsoon season. *Subject Headings:* **1. Radar analysis of rain 2. Monsoon rainfall 3. Rain formation.**—*I.S.*

11H–127 551.501.81:551.515.2(75)

Sadowski, Alexander (*U. S. W. B., Wash., D. C.*), **Atlantic coastal radar tracking of 1958 hurricanes.** *Journal of Geophysical Research*, Wash., D. C., 64(9):1277–1282, Sept. **1959.** 11 figs., 4 refs. **DLC**—In 1958 Atlantic Coastal radars performed a historic feat by continuously tracking two hurricanes—"Daisy" and "Helene"—for 500 naut mi. The manner of accomplishment is discussed for each. The use of logarithmic spiral overlays on the radar PPI scope to locate the eye of "Daisy" is illustrated. Photographs are presented showing hurricane "Helene" as it appeared on the WSR-1 radar at Charleston, S. C., and on the more powerful SP-1M at Cape Hatteras, N. C. Personal observations of the author, who operated the SP-1M radar at the Weather Bureau Office, Cape Hatteras, with another radar meteorologist, during the passage of the hurricanes, are presented. *Subject Headings:* **1. Radar hurricane tracking 2. Atlantic Coast, U. S.**—*Author's abstract.*

11H–128 551.501.81:551.558.1:551.576.1(438)

Salamonik, Stanisław, **Wstępne wyniki radarowych obserwacji chmur.** [Preliminary results of cloud observation by radar.] *Przegląd Geofizyczny*, Warsaw, 3(1):3–7, **1958.** 5 figs., table, 2 refs. French summary p. 7. **DWB, DLC**—Preliminary results of cloud observations (40 clouds) by means of radar with a 10 cm wave length carried out in July 1957 in the vicinity of Warsaw by the Department of Meteorological Forecasts are discussed. Adjoined tables and graphs show particularly interesting shapes of convective clouds in various synoptic conditions. Altitudes of cloud tops, bringing showers, and of thunderstorm clouds were also studied. *Subject Headings:* **1. Radar observation of clouds 2. Convective clouds 3. Warsaw, Poland.**—*A.M.P.*

11H–129 551.501.81:551.515.4 551.554:551.578.1

Sarrica, O., **Una caratteristica evoluzione degli echi radar provenienti da temporali.** [Typical development of radar echoes from thunderstorms.] *Associazione Geofisica Italiana, 7th, Rome, Nov. 1957. Atti*, pub. Rome, [**1958?**]. p. 73–85. 10 figs (incl. photos), table, 9 refs., 6 eqs. Italian and English summaries p. 84.—Radar echoes observed on the PPI during a thunderstorm are examined and related with the precipitation of hail on the ground, and the behavior of wind aloft. It is found that the fast growing of long "tongues" observed on the edge of one thunderstorm echo is related to the existence of a strong vertical wind shear, and the action of the shear on the storm precipitation is examined. In the case observed, the wind shear does not completely prevent the falling of hail to the ground, but it is found that the existence of a strong wind shear determines less favorable conditions for the growing of hailstones. *Subject Headings:* **1. Radar echoes from thunderstorms 2. Wind shear effects on hail formation.**—*Author's abstract.*

11H–130 523.164.83

†Senior, T. B. A. and Siegel, K. M. (*Univ. Michigan*), **A theory of radar scattering by the moon.** *J. S. National Bureau of Standards, Journal of Research, Sec. D*, 64(3):217–229, May/June **1960.** figs., table, 25 refs., 17 eqs. **DWB, DLC**—A theory is described in which the moon is regarded as a

"quasi-smooth" scatterer at radar frequencies. A scattered pulse is then composed of a number of individual returns each of which is provided by a single scattering area. In this manner it is possible to account for all the major features of the pulse, and the evidence in favor of the theory is presented. From a study of the measured power received at different frequencies, it is shown that the scattering area nearest to the earth is the source of a specular return, and it is then possible to obtain information about the material of which the area is composed. The electromagnetic constants are derived and their significance discussed. *Subject Heading:* **1. Radar echoes from moon.**—*Authors' abstract.* Ⓢ

11H–131 551.515.23:551.501.81

Senn, H. V. and Hiser, H. W., **Studies of the evolution of hurricane spiral bands and their relationship to other synoptic storm parameters, July 1, 1957 to June 30, 1958.** Miami. Univ. (Coral Gables, Fla.). Marine Lab., Contract Cwb-9174, Final Report, Aug. **1958.** 37 p. 7 figs. 5 tables, 12 refs., 3 eqs. **DWB** (M15.2 M618st)—Several hundred graphical and mathematically computed correlations are presented which strengthen earlier conclusions that spiral band crossing angles increase with radius from the storm center and with increasing surface roughness parameters which have been encountered by the storm center three hours before, and decrease with increasing band length. It is shown that the quadrants in which the eye of the storm is open provide a good indicator as to the immediate direction toward which the storm is moving. Sampling difficulties which invalidated many of the correlations, are also discussed. Preliminary results on radar echo speed and direction versus range from the storm center and echo direction versus storm quadrant are presented. A new hypothesis regarding the evolution of spiral bands is presented with evidence to support the conclusions that the bands are produced near the center of the storm and move radially outward, maintaining their quadrants of origin. Data from several hurricanes are used to illustrate this hypothesis. *Subject Headings:* **1. Hurricane spiral bands on radar 2. Radar hurricane tracking.** —*Authors' abstract.*

11H–132 551.501.81

Senn, H. V. (*Marine Lab., Univ. of Miami*), **Observations and possible explanations of certain fine lines.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings* issued **1958.** Sec. D:31–36. 4 figs., table, 6 refs. **DWB** (M01.81 R124 pc, 1958)—Observations of several radar "thin bands" on both MPS-4, 4.7 cm and SP-1M, 10.7 cm radars show that at least one type of band is confined to very low levels. Several possible explanations are given for the existence of these bands. But most evidence seems to indicate that ground targets are being observed, probably as a result of a combination of refraction and forward scattering from abrupt low level changes in the refractive index which are caused by local convective activity. Another type of fine line, which appears as a circular arc on airborne radars, can be attributed to solid targets which are picked up on side lobes of the radar beam. *Subject Headings:* **1. Radar thin bands 2. Airborne weather radar.**—*Author's abstract.*

11H–133 551.501.81:551.515.2:551.577.1

Senn, H. V. and Hiser, H. W. (*both, Univ. Miami*), **On the origin of hurricane spiral rain bands.** *Journal of Meteorology*, Boston, 16(4):419–426, Aug. **1959.** 9 figs., table, 19 refs., eq. **DWB, DLC**—Analysis of the histories of spiral rain bands as observed on radar indicates that they are usually formed near the center of the storm and propagate radially outward. The rain band, therefore, maintains a quasiconservative position relative to the quadrants in which it is formed and does not rotate about the storm center. Furthermore, the radar echoes are not simply preexisting elements which assume the spiral shape but appear to have their origin in the outward propagated bands. Data from several hurricanes are used to illustrate this hypothesis. Evidence is also presented which indicates that the eye of the hurricane is defined by a wall cloud made up of one or more spiral-band fragments in the process of generation. *Subject Headings:* **1. Radar analysis of hurricanes 2. Hurricane spiral bands on radar.**—*Authors' abstract.*

11H–134 551.501.81:551.515.23

†Senn, H. V.; Hiser, H. W. and Low, E. F., **Studies of the evolution and motion of hurricane spiral bands and the radar echoes which form them.** Miami, Univ. (Coral Gables). Marine Lab. Contract Cwb-9480, Final Report, Aug. **1959.** 65 p. 17 figs., 2 tables, 28 refs. **DWB** (M15.2 M618stu)—Studies of radar echo vector motion in relation to a stationary hurricane center have been made for 1573 echo trajectories from hurricanes "Edna" 1954, "Connie," "Diane," and "Ione" 1955, "Audrey" 1957, and "Daisy" and "Helene" 1958. The data indicate that echo trajectories, while generally down spiral bands, have crossing angles which are smaller than those found for spiral bands in previous studies. (For definition of "crossing angle" see Fig. 8.) Furthermore, the radius of a point on a spiral band (not an individual echo) in a given quadrant increases with time, resulting in an outward motion of the band. Preliminary results of several attempts to derive a mathematica

model of echo-spiral band motion under various assumptions are also presented. *Subject Headings:* **1. Radar analysis of hurricanes 2. Hurricane spiral bands on radar.**—*Authors' abstract.*

11H–135 551.501.81:551.515.4 551.508.326

Shackford, Charles Reeve, (*Allied Res. Assoc., Boston*), **The detection by CPS-9 radar and short range forecasting of severe and very severe thunderstorms.** Allied Research Associates, Inc., Boston, Contract AF 19(604)-5204, Scientific Report No. 5, Dec. 31, **1959.** 18 p. 5 figs., 2 tables, 9 refs. **DWB** (M(051) A436sci)—The discovery that an important radar characteristic of severe and very severe thunderstorms is the reflectivity maximum at levels above 10,000 ft requires a new operational technique by which the reflectivity at various levels aloft of the most intense core of a thunderstorm can be quickly determined. A practical method for doing this is described herein. The reflectivity profile of an echo can be obtained in three minutes or less and the values at three significant levels can be compared for forecast purposes with standard values associated in the past in New England with severe and very severe storms—i.e., storms which may possibly or are likely to produce tornadoes. The method also makes it possible to obtain more frequent reflectivity profile measurements, a very important consideration to meteorological research. *Subject Headings:* **1. Radar storm detection 2. Severe storm forecasting.**—*Author's abstract.*

11H–136 551.594.221:551.577:551.501.81

Shackford, Charles Reeve, **Radar indications of a precipitation-lightning relationship in New England thunderstorms.** *Journal of Meteorology*, Boston, 17(1):15–19, Feb. **1960.** 8 figs., 2 tables, 11 refs. **DWB, DLC**—Thunderstorm electrical activity in terms of surface-observed lightning-stroke rate is related to radar-reflectivity maxima above the OC level and to vertical profiles of radar reflectivity. This, and the fact that it is also related to the incidence of hail at the surface, lends support to a previously stated theory of charge generation and separation by WORKMAN and REYNOLDS. Observer data show an order of events at the surface which indicates a thunderstorm structure coinciding with previous models. *Subject Headings:* **1. Lightning-rainfall relationships 2. Radar echoes from thunderstorms.**—*Author's abstracts.*

11H–137 551.501.81:551.509.34

Smith, Gordon D., **The use of radar in the preparation of local forecasting studies.** Texas. Agricultural and Mechanical College. Dept. of Oceanography and Meteorology, Contract AF 19(604)-1564, Technical Note, No. 1, July **1957.** 12 p. fig.—The use of radar in a) the solution of local problems involving dynamic processes in the atmosphere (meso-scale phenomena, precipitation area motion, squall lines, etc.), b) the station orientation of newly assigned forecasters and c) the collection of climatological data are discussed. Suggestions concerning the filing and recording of radar photographs (still or time-lapse) for future reference are included. *Subject Headings:* **1. Local forecast studies 2. Radar meteorology 3. Radar photographs.**—*G.T.*

11H–138 551.501.81:551.509.31:778.3

†Smith, Gordon D., **Use of composite radar photographs in synoptic weather analysis.** Texas. Agricultural and Mechanical College. Dept. of Oceanography and Meteorology, Contract AF 19(604)-1564, Scientific Report, No. 3, Aug. **1957.** 52 p. 15 figs., table, 29 maps, 25 refs. "A Master's thesis." **DWB** (M01.81 T355sc)—The use of radar weather observations in analysis of weather charts is considered. These observations are in the form of composite radar PPI photographs. A symbology is suggested for depicting the gross features of the radar precipitation echoes. The symbology can be used to indicate echo analysis of PPI photographs and to plot radar data obtained from the photographs on surface weather charts. Two methods for combining radar data with surface observations are suggested. *Subject Headings:* **1. Radar photographs 2. Synoptic analysis using radar data.**—*Author's abstract.*

11H–139 551.509.31:551.508.85:771:778.3

Staats, Wayne F. and Tarble, Richard D. (*both, U. S. W. B., Wash., D. C.*), **An automatic photo-timer for use in making integrated radar echo photographs.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. F:9–13. fig., 4 refs. **DWB** (M01.81 R124pc, 1958)—An automatic photo-timer for use on Weather Bureau Radar Sets has been developed. Its utilization with the Polaroid Land Camera in taking multiple-exposure transparencies of the PPI scope is indicated. The operational application of this photographic device and procedure to Weather Bureau Flash-flood and River Forecasting is discussed. *Subject Headings:* **1. Radar photographs 2. Automatic photo-timer 3. Forecast aids.**—*Authors' abstract.*

11H–140 551.501.81:551.551

Stackpole, John D. (*Wea. Radar Res., M. I. T.*), **Some spectra of turbulence in the free atmosphere.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings,*

issued **1958.** Sec. G:1 8. 2 figs., 5 refs., eq. **DWB** (M01.81 R124pc, 1958)—The output of the R-meter, a device which counts the rate at which a received radar signal crosses a known voltage level, can be processed to give the short term variations of the RMS wind within the illuminated volume. From such data the power spectra of the turbulence can be calculated. Four horizontal and one vertical gust spectra are presented, measured at selected elevations from 1000 to 18,300 ft. Each has a frequency range of 0.004 to 1.0 cps and they appear to be essentially flat beyond 0.03 cps. A comparison is made between the observed energy frequency relationship at the extreme low end of the spectrum and the relation indicated by the Kolmogorov similarity hypothesis. Discussion of errors inherent in the determination of the spectra is included. *Subject Headings:* **1. Radar turbulence measurement techniques 2. Turbulence spectra 3. Kolmogorov similarity hypothesis.** —*Author's abstract.*

11H–141 551.508.85 551.501.81:551.515.2

Staggs, Donald W. and Wilk, Kenneth E., **A multiple overlay for weather radar.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. F:53. fig. **DWB** (M01.81 R124pc, 1958)—The coupling diagram of the simple solution to meet the requirement for rapid and precise echo location of local storms by a AN/CPS-9 radar is described. The method involves using the extra section of the range switch for furnishing edge lighting of the 250, 100, and 50 mi overlays made from 1/16 in. lucite inscribed also for correction of overlays. The proved value suggests that any stationary weather radar should be modified in a similar manner. *Subject Headings:* **1. Radar weather instrumentation 2. Radar storm detection.**—*W.N.*

11H–142 551.508.85:37

Sutton, Robert W.; Fulmer, Allen L. and Decker, Fred W. (*all, Oregon State College*), **An educational weather radar.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. G:22–24. ref. **DWB** (M01.81 R124pc, 1958)—Using readily available surplus electronic components, an educational institution can install at relatively low cost a 3 cm weather radar system having a 3° beam and PPI presentation ranges available up to 200 nm. Descriptive details, costs, and performance evaluation are discussed. *Subject Headings:* **1. Radar equipment for educational institutions 2. Weather radar.**—*Authors' abstract.*

11H–143 551.508.85:551.515.2

†Sutton, Robert W.; Hunsucker, Robert D. and Pike, Julian M., **The role of instrumentation in forecasting and tracking intense storms.** (In: Decker, Fred W. et al., **Instrumentation and techniques for Army weather observation.** Oregon. State College, Corvallis. Dept. of Physics, Contract DA-36-039 SC-73186, 4th Quarterly Technical Report, **1958.** p. 10–20. table, 22 refs.) **DWB** (M01 066i)—The birth of radar now used in the detection of storms is surveyed historically. In 1949 the Signal Corps Engineering Laboratories at Fort Monmouth, N. J., first used radar exclusively as a weather detection device. The recent Weather Bureau specification for a weather radar is the WSR-57, a 10 cm radar with a power output of 500 kw having a 12-ft dish that gives a 1.8° conical beam. In this report certain inherent limitations of linear extrapolation are studied as applicable to precipitation echoes when observed on a PPI radar scope. Limitations of using radar alone in forecasting and tracking intense storms are discussed under the following groups: range attenuation, precipitation attenuation, siting effects, and others. Meteorological observations at various points are included. *Subject Headings:* **1. Radar storm detection. I. Oregon. State College, Corvallis. Dept. of Physics II. Contract DA-36-039 SC-73186.**—*N.N.*

11H–144 551.501.81:551.515.2 551.577.2(529)

Tang, Chieh-hsi, **On the choice of radar wave length under climatical conditions of Taiwan.** *Meteorological Bulletin*, Taipei, Taiwan, Formosa, 4(4):23–29, Dec. **1958.** 7 figs., 6 tables, 8 refs. 13 eqs. In Chinese; English summary p. 23. **DWB, DLC?**—The efficiency of radar detection is generally affected by the amount of precipitation and is closely related to the wave lengths of the radar employed. According to the equation,

$$R_{max} = \sqrt{\frac{F\pi^6}{192}\left|\frac{e-1}{e+2}\right|^2 \frac{PtA\phi hZ^3}{PrM_{in}\lambda^4}} \cdot 10^{-0.1K\int Idr}$$

the maximum detectable range of radar is indicated in Figure (4). This shows that wave length of 3.2 cm is suitable for detection of rain ranging from 0.3 mm/hr; 5.7 cm for rainfall varying from 3.1–15.0 mm/hr; and 10 cm for heavy rain ranging from 15.1–100.0 mm/hr. Main reasons for the installation of radar stations in Taiwan are: (1) for the detection of typhoons during the summer and (2) to study the passage of frontal systems during the winter, in particular. The result of this paper will indicate the relationship between the predominant climate and the intensity of rainfall in Taiwan. The choice of weather radar wave lengths has found that wave length 10 cm is most

suitable for the detection of typhoons because the range of hourly mean rainfall is generally within a limit of 15.1–100.0 mm/hr. On the other hand, wave length of 5.7 cm is suitable for the observation of movement of the fronts, which frequently give a mean rainfall within the limit of 3.1–15.0 mm/hr. *Subject Headings:* **1. Radar analysis of precipitation 2. Radar observation of typhoons 3. Formosa.**—*Author's abstract.*

11H–145 551.501.81:551.515.2:061.3

Tepper, Morris (*U. S. W. B.*), **A theoretical model for hurricane radar bands.** (In: Technical Conference on Hurricanes, Miami Beach, Fla., Nov. 19–22, 1958, **Proceedings,** issued **1958** (?). Section C 10 (13 p.) 4 figs., 16 refs.) **DWB** (M15.2 A512pr). Also issued in: *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings,* issued **1958.** Sec. K:56–65. 4 figs., 16 refs., eqs. **DWB** (M01.81 R124pc, 1958)—Observations of hurricane radar bands and of conditions associated with them, are similar to those of the mid-western U. S. squall line. Consequently, a theoretical model involving atmospheric gravity wave propagation, used to explain the behavior of squall lines, is attempted for the hurricane radar bands as well. The hurricane is assumed to consist of three regions: the eye, a ring of convergence and an external region. Assuming the existence of an inversion surface aloft in the latter two regions, it is shown that inflow into a stationary hurricane with a homogeneous external region will produce a circular outward moving gravity wave. When the external region is asymmetrical, and/or when the hurricane is moving rapidly they will appear spiral-like. Individual convective cells carried by the circulating winds will move relative to the radar band in a manner similar to that of individual convective cells relative to a squall line. *Subject Headings:* **1. Radar analysis of hurricanes 2. Hurricane spiral bands on radar.**—*Author's abstract.*

11H–146 551.501.81:551.501.9

Thompson, George K., **Services aiding the study and recording of meteorological phenomena in correlation with radar reflectivity patterns of precipitation as observed at or adjacent to the Blue Hill Meteorological Observatory, Milton, Mass.** Harvard Univ. Contract AF 19(604)-4942, Final Report No. 5, Oct. 31, **1959.** 9 p. 7 figs. **DWB** (M(051) H339se)—The report summarizes utilization of the facilities and services of the Blue Hill Meteorological Observatory at Milton, Mass., by the Weather Radar Branch of the Geophysics Research Directorate for the period Nov. 1, 1958 through Oct. 31, 1959. The activity constituted in general scope, but in diminishing detail, the services provided under Contract AF 19(604)-1371, which terminated Oct. 31, 1958. Services during the ensuing period included operation and maintenance of meteorological recording equipment, processing photographs, making and recording visual observations, extracting pertinent data from observational records, typing data, reports and correspondence and making improvements or additions to the display system. As the contract progressed, increased emphasis was given to new instrumentation arising from shifts in project objectives and diminishing emphasis was given to operation and maintenance of meteorological equipment, cataloging of publications, photography, manual observations, data extraction and general clerical activities. Each of these activities, including progress made in improving working facilities, is cited in the Report, but more detailed information is recorded on instrumentation projects which included a Torque Amplifier, Pulse Integrator and Rain Drop Spectrograph. *Subject Headings:* **1. Radar weather installations 2. Meteorological instruments 3. Blue Hill Meteorological Observatory, Milton, Mass.**—*Author's abstract.*

11H–147 016:551.510.62:551.501.81(02)

†Thuronyi, Geza, **Recent literature on radar meteorology.** *Meteorological Abstracts and Bibliography,* Boston, 9(8):1005–1030, Aug. **1958.** 130 refs. **DWB**—130 items on radar meteorology, published in world literature and not included in two earlier bibliographies on the subject (*Met. Abstracts,* 1951 and 1955), are abstracted, presented in an author arrangement and provided with a subject outline. *Subject Headings:* **1. Radar meteorology bibliographies 2. Bibliography on radar meteorology.**—*G.T.*

11H–148 551.501.81:551.510.62

Tolbert, C. W.; Straiton, A. W.; Britt, C. O. and Garhardt, J. R. (*all, Elec. Eng. Res. Lab., Univ. Texas*), **Measurement and analyses of atmospheric echoes from millimeter radio wavelengths.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings,* issued **1958.** Sec. E:9–16. 3 figs., 5 refs. **DWB** (M01.81 R124pc, 1958)—In an effort to shed further light on the propagation effects which have given rise to the radar echoes known as angels, a series of measurements were made at 8.6 and 4.3 millimeter wavelengths using natural atmospheric and laboratory simulated targets. The free atmosphere studies made use of vertically pointing transmitter and receiver horn-type antennas having an essentially common volume. Significant backscattered energy from natural targets was a frequent phenomenon at both wavelengths. The laboratory

studies were made using an 8.6 mm cw radar, and consisted of back-scattering cross-section measurements of a number of artificial targets ranging from suspended insects and water drops to simulated gas refractive index gradients having a maximum change of up to 150 N-units across a soap film boundary. In no case was it possible to obtain a return from the simulated gradients which were comparable to those noted either from the atmospheric studies or from the suspended particulate matter. *Subject Headings:* **1. Radar angels 2. Radar propagation.**—*Authors' abstract.*

11H–149 551.501.81:551.557

Treussart, Henri. **Poursuite automatique en distance pour un radar de mesure de vent en altitude.** [Automatic device for a moving target indicator radar of upper wind measurements.] *Journal Scientifique de la Météorologie*, Paris, 10(40):157–165, Oct./Dec. **1958.** 6 figs. French, English and Spanish summaries p. 157. **DWB**—Description of an automatic device especially designed for a moving target indicator radar used for upper wind (rawin) observations. This device increases the accuracy of the sounding, and at the same time simplifies it. The material used is described and an account of the principle of the automatic device is given, together with a diagram of the different apparatus put into use. *Subject Heading:* **1. Rawinsonde techniques.**—*A.V. and author's abstract.*

11H–150 551.501.81:551.515.23

Truppi, Lawrence E. (*Nath. Wea. Records Center, Asheville, N. C.*), **An airborne radar reconnaissance of typhoon Agnes.** (In: Technical Conference on Hurricanes, Miami Beach, Fla., Nov. 19–22, 1958, **Proceedings**, issued **1958** (?). Section C 7 (10 p.) 8 figs., 4 refs.) **DWB** (M15.2 A512pr,). Also issued in: *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued 1958. Sec. K:39–45. 8 figs., 4 refs. **DWB** (M01.81 R124pc, 1958)—Using 35 mm radarscope data furnished by weather reconnaissance aircraft of the U. S. Air Force, an investigation is made into the phenomena displayed on the PPI scope of an airborne radar during a flight into the eye of typhoon "Agnes" on Aug. 20, 1957. Besides recording the spiral and circular bands of precipitation echoes, the radarscope film reveals echo patterns which do not result from precipitation. Data from synoptic charts and ships in the vicinity of the storm and swell generated by the winds of typhoon "Agnes" are given. *Subject Headings:* **1. Radar observation of typhoons 2. Radar precipitation echoes 3. Typhoon "Agnes" (1957).**—*Author's abstract.*

11H–151 551.501.81(02)

U. S. Air Weather Service, **Radar weather observations.** Its *Manual AWSM* 105-27, June 1, **1959.** 19 p. fig Supersedes edition of April 1, 1958 (for abstract on 1958 ed., *see* 9H–97, Aug. 1958, *Met. Abs.*). **DWB** (M(055) U58am)—Revised instructions for plain language codes for recording and reporting radar weather observations at U. S. Air Weather Service Radar weather stations. Instructions for transmission and display of information are also included in manual. *Subject Headings:* **1. Radar weather message codes 2. Radar meteorology manuals.**—*M.R.*

11H–152 551.501.81:551.509.322(02)

U. S. Weather Bureau, **Manual of operations: internal Weather Bureau RAREP and warning coordination system (RAWARC), Circuits 7060–7061–7062.** 2nd ed. Dec. **1955.** 14 p. **DWB** (M09.1 U587md,)—The stations on the 3 Weather Bureau Radar Reporting and Warning system circuits are listed and instructions for transmissions and relays outlined. The 3 circuits come together at the Weather Bureau Office, Kansas City, where relays and monitoring are conducted. *Subject Headings:* **1. Communications manuals 2. Radar and warning coordination system 3. Eastern United States.**—*M.R.*

11H–153 551.501.81(02)

U. S. Weather Bureau, **Manual of radar meteorological observations.** 3rd ed., June 1, 1957 (rev. to include changes 1, 2, and 3). Wash., D. C., Sept. **1958.** 30 p. 7 figs. **DWB** (M01.1 U587ma)—Different functions of the various parts of a radar system are discussed with particular reference to echo tracking and the evaluation of the data. The author illustrates the best way of using the A-scope, where it is available, and discusses the results of the illustrative operations of the A-scopes as to their observed characteristics, and to intensities of the hurricane echoes observed by them. *Subject Heading:* **1. Radar meteorology manuals.**—*N.N.*

11H–154 551.501.81:551.557

*U. S. Weather Bureau, **Report on Upper-Wind Test Project, Washington, D. C., 1958.** Issued Washington, D. C., April **1959.** 10 p. of text. 9 figs. Almost entirely tables and graphs. **DWB** (M57 U587re)—Comparative winds-aloft observations were taken at Wash., D. C. from January through March 1958, using AN/GMD-1A and AN/GMD-2 Rawin, a Decca Wind-tracking Radar, and a conventional optical theodolite. These observations show good agreement in wind directions

and speeds obtained with the various systems; however, some rather large apparent differences would arise in the data were it reported at fixed altitudes. This is owing to differences in heights obtained by the various methods. Data are presented in extensive tables and graphs. Equipment is described and illustrated and a comparative wind speed profile presented on a large graph, with a curve for each of the 4 types of radar equipment, with data up to 100,000 ft. *Subject Heading:* **1. Radar wind measurement techniques.**—*Author's abstract & M.R.*

11H–155 551.508.85:551.501.81(02)

van Straten, F. W. (*Naval Weather Service*), **Radar as a weather instrument; a manual.** *U. S. Office of Naval Operations, NAVAER* 50-1P-544, Oct. 1, **1957.** 7 chs., paged separately. numerous figs., plate, tables, eqs. **DWB** (M(055) U585n)—A guide book for those interested in radar meteorology, written in simple and uncomplicated language, with numerous examples and illustrations. The manual presents suggestions for the use and interpretation of radar weather. The entire discussion is divided into seven chapters, discussing in general, radar principles, instrumentation, and radar problems. The final chapter presents the results of a research conducted by the Univ. of Miami which may serve as a valuable tool to the practicing meteorologist. *Subject Heading:* **1. Radar meteorology manuals.**—*I.S.*

11H–156 551.501.81:551.577:551.515.4

Vonnegut, Bernard; Moore, Charles B.; Botka, Alexander T. and Sykes, Wendell G., **Hollow initial radar precipitation echoes in New Mexico thunderstorms.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. C:16–25. 5 figs., table, 6 refs. **DWB** (M01.81 R124pc, 1958)—Observations of storms made from the summit of Mt. Withington, N. M. in 1957 with a sensitive 3 cm RHI radar disclosed that the initial echo was frequently in the form of a hollow inverted cup. On those occasions when electric field measurements were made within the growing cloud, it was frequently observed that the appearance of the initial echo was usually preceded several minutes by reversal of the fair weather field. It was determined in several cases that the top of the cup-shaped radar echo was several thousand feet beneath the visual top of the cloud. The hollow echoes usually filled in rapidly and increased in intensity. As the echoes extended downwind, virga and rain were observed beneath the cloud, strongly suggesting that the initial echo was caused by precipitation. The fact that no bright bands were observed and the fact that the echoes were frequently entirely beneath the melting level indicates that they were probably from liquid rather than solid precipitation. *Subject Headings:* **1. Radar precipitation echoes 2. Radar observation of thunderstorms.**—*Authors' abstract.*

11H–157 551.501.81:551.515.31

Ward, Neil B. (*U. S. W. B., Oklahoma City*), **Energy distribution and flow patterns in vortex motion and some relations to radar echoes.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. A:38 47. 10 figs., 4 refs. **DWB** (M01.81 R124pc, 1958)—An analytical discussion is given of the fluid forces involved in vortex motion, and of the transfer of fluid energy in vortex development and intensification. Flow patterns in a real vortex are described and illustrated. Some aspects of these phenomena, as observed by radar and in detailed investigation of storm damage, are discussed. A simplified approach is made to a relationship for intensity approximation by use of non-dimensional relations and values obtained by model experiment. *Subject Headings:* **1. Radar echoes from vortexes 2. Vortex dynamics.**—*Author's abstract.*

11H–158 551.501.81 551.508.85:551.577

Welti, George R. (*Raytheon Manuf. Co.*), **Meteorological effects on receiver spectra of Doppler navigators.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. G:13–18. 4 figs., ref. **DWB** (M01.81 R124pc, 1958)—The operation of Doppler navigators for aircraft is explained, and the effects of precipitation clutter are examined. Atlas-Kessler models for wide-spread precipitation are compared, and a representative curve of reflectivity versus altitude is selected. A method of computing signal-to-clutter ratio is outlined, and the results of typical computations are shown in the form of graphs. It is found that for typical continuous-wave radars, the signal-to-clutter ratio is minimum at a critical aircraft altitude. The critical altitude depends mainly on the minimum range of the radar. Signal-to-clutter ratios can be improved by keying and by using lower microwave frequencies. *Subject Headings:* **1. Doppler radar 2. Radar signal-to-clutter ratios 3. Radar precipitation analyses.**—*Author's abstract.*

11H–159 551.501.81:551.509.324.2

Wexler, Raymond, **Radar patterns as a forecast aid: a case study.** Allied Research Associates, Inc., Boston, Mass., Contract AF 19(604)-3492, (Unnumbered Report), May 29, **1958.** 20 p. 10 figs., 6 refs., eq. **DWB**—On Dec. 2, 1952, surface weather map indications and a lowering cloud

deck threatened imminent snow to the Boston area. However, changing radar echo patterns aloft gave three important clues that precipitation would not be appreciable: (1) The transformation of the upper portion of the echo from a uniform pattern (type 3) to a cellular pattern (type 1) with top at a lower level, indicated advection of dry air aloft and a reduced precipitation rate, (2) A simultaneous cessation of the stalactites at the echo base also indicated a reduced precipitation rate, (3) A remarkably changing wind profile, as determined from the slopes of the trails, indicated advection of warm air tending to stabilize the precipitation forming region near the echo top. Indeed, it turned out that only a trace of snow fell during the succeeding 24-hr period. *Subject Headings:* **1. Radar precipitation echoes 2. Weather radar applications to precipitation forecasting 3. Forecast aids 4. Boston, Mass.**—*Author's abstract.*

11H–160 551.501.81:551.577.11

Wexler, Raymond (*Allied Res. Associates*) and Atlas, David (*Geophysics Res. Directorate*), **Precipitation generating cells.** *Journal of Meteorology*, Boston, 16(3):327–332, June **1959.** 5 figs., 9 refs. **DWB, DLC.** Also issued in: *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. A:30–37. 4 figs., 8 refs. **DWB** (M01.81 R124pc, 1958)—Advection of dry air aloft, ahead of the upper level trough, forms a convectively unstable layer which transforms a relatively uniform echo to a cellular pattern with echo top at a lower elevation. A characteristic sequence of cell structure ensues: first, cells without trails and, lastly, trails without "heads." Observation indicates that the cells are associated with cumuliform tufts imbedded in a stratiform deck. Reflectivities are maximum at the base of the cells. Updrafts required to produce equivalent precipitation intensities are 40 to 80% of fall speeds and suggest growth of the ice crystals both during their ascent and descent through the updraft. Radar-deduced fall velocities are consistent with those of the observed crystals only if the cells are assumed to move with the winds at their bases; this is the true generating level. *Subject Headings:* **1. Radar precipitation studies 2. Precipitation mechanics.**—*Authors' abstract.*

11H–161 551.508.85:551.576

Wilk, K. E., **Evaluation of the AN/APQ-39(XA-3) cloud detector radar.** Illinois. State Water Survey. Meteorologic Lab. at the Univ. of Illinois, Contract AF 19(604)-1395, Final Report, March 16, 1955–March 31, **1958.** 39 p. 13 figs. (incl. photos), 7 tables, 10 refs., eqs.—This report is an evaluation of a ground based AN/APQ-39(XA-3) radar, meteorological instruments, and cloud photography. The observed data and radar characteristics are analyzed to determine the empirical detection capabilities, theoretical detection capabilities, and the synoptic interpretations of the radar echoes. The results indicate the AN/APQ-39(XA-3) radar is capable of detecting 77% of the observed clouds. Cloud genera usually can be identified from the configuration of the radar return. The radar also provides limited knowledge of the existence and character of precipitation and of the air mass structure. *Subject Headings:* **1. Radar cloud detection 2. Radar equipment.**—*Author's abstract.*

11H–162 551.508.85:551.501.81:551.576

Wilk, Kenneth E. (*Illinois State Water Survey*), **Synoptic interpretation with 0.86 CM radar.** *Weather Radar Conference, 7th, Miami Beach, Florida, Nov. 17–20, 1958, Proceedings*, issued **1958.** Sec. I:1–8. 9 figs., 4 refs. **DWB** (M01.81 R124pc, 1958)—During the winter of 1957–58, the Illinois State Water Survey evaluated the AN/APQ-39 (XA-3), 0.86 cm cloud detection radar. The radar, originally designed as airborne equipment, was modified to a twin antenna system and evaluated as a ground based unit. The evaluation program was supported by the Air Force Cambridge Research Center under Contract No. AF 19(604)-1395. The observed data were correlated with cloud photography and Rawinsonde observations to determine the empirical detection capabilities of the radar and the synoptic interpretations of the radar echoes. The results indicate this vertical pointing radar is capable of detecting 77% of the observed clouds in winter in the Midwest. Cloud genera usually can be identified from the configuration of the radar return. Certain airmass and frontal zone characteristics are evident in echo patterns. The interpretation of these patterns can aid in the refinement of the synoptic analysis. *Subject Headings:* **1. Radar cloud detectors 2. Radar synoptic analysis.**—*Author's abstract.*

11H–163 523.164.83

Yaplee, B. S.; Bruton, R. H.; Craig, K. J. and Roman, N. G. (*all, U. S. Naval Res. Lab., Wash., D. C.*), **Radar echoes from the moon at a wavelength of 10 cm.** *Institute of Radio Engineers, N. Y., Proceedings*, 46(1):293–297, Jan. **1958.** 8 figs., 15 refs. **DLC**—Radar contact has been made with the moon with short pulses at 2860 mc, beginning a program of short-pulse lunar radar. The principal objective of the program is to obtain more accurate moon-to-earth distances than presently are known. Other information may result from the program, such as the earth's diameter, the interplanetary electron density, and the lunar surface characteristics. To date, the program has

yielded the following results: earth-moon distances have been measured over several days with consistencies of less than one-half mile; several rough reflectivity measurements have been made which indicate that the radar cross section of the moon is 975 sq mi at 2860 mc with pulses of 2-μ sec duration, and the fine structure of echoes may be correlated with lunar topography. *Subject Heading:* **1. Radar echoes from moon.**—*Authors' abstract.*

11H–164 551.501.81:551.577.1:551.576.1

Zum Einzugsbereich von Schauerwolken. [Invasion area of shower clouds.] *Meteorologische Rundschau*, Berlin, 11(2):67–68, March/April **1958.** 3 figs., table, 6 eqs. **DWB**—With the aid of radar and precipitation observations it is possible to measure the precipitation content of shower clouds. The amount of precipitation within a specified time is given by $m = \int_{\cdot} J \cdot dF$ where J = mean rainfall intensity, and F = area observed on the radar screen. The radius of the area that has the same amount of water in vapor forms can be determined by $r = \sqrt{\frac{J \cdot F}{\pi \cdot k \cdot h \cdot \bar{d}}}$ where h = height of the disc shaped invasion area, $\bar{d}$ = mean absolute atmospheric humidity ($2/m^3$), for h and k (hour-1) = capture factor. The distance (S) covered by a cloud of given surface in an hour in order to take up the necessary amount of water vapor from the air volume traversed is given by $S = \frac{J \cdot b}{k \cdot h \cdot \bar{d}}$ where b is a square cloud surface. The capture factor $k = 0.3$ is shown to yield agreement between computed S and actual passage velocity. If the equation for S is valid, it can be written as $\frac{J \cdot b}{k \cdot h \cdot \bar{d}}$ = constant, since the passage velocity given by flow aloft can be regarded as constant for the duration of the shower and thunderstorm cells. *Subject Headings:* **1. Radar precipitation measurement techniques 2. Precipitation calculations.**—*I.L.D.*

SUPPLEMENTARY MATERIAL

11H–165 551.501.81:551.553.11

Atlas, David (*GRD, AF Camb. Res. Center, Mass.*), **Radar detection of the sea breeze.** *Journal of Meteorology*, Boston, 17(3):244–258, June **1960.** 14 figs., table, 11 refs., 4 eqs. **DWB, DLC**—Radar and meteorological observations of four sea-breeze cases are presented. A clear-cut association between the echoes and the meteorological events is demonstrated. Where direct measurements are not available, the echo patterns are consistent with a rational physical picture of the sea breeze. Birds, insects, and other particulate matter are precluded by a combination of direct observation of the small pulse volume, by echo magnitude considerations, and by echo pattern. Scattering theory can account for the magnitude of the coherent layer echoes on the vertical beam, at the sea-breeze inversion with large but reasonable refractive-index gradients of 4 to 9 N units per cm or with vapor gradients of about 1 to 2 mb per cm. Incoherent echoes on the horizontal beam appear to come from vapor sheaths of large radius of curvature, with index gradients of similar magnitude, which are oriented parallel to the sea-breeze front. While this unusual result is supported by the streamer-form echo patterns and the steady sea-breeze winds, further verification is required. The horizontal beam echoes disappear with the onset of the usually deeper mesoscale southwest sea breeze because this air, with a long overwater trajectory, has a vertically homogeneous moisture distribution which prevents sharp vapor fluctuations. The crucial condition necessary for the occurrence of persistent sea-breeze echoes on a horizontal beam is the sharp moisture lapse in the low levels. *Subject Headings:* **1. Radar observation of sea breezes 2. Sea breeze structure.**—*Author's abstract.*

11H–166 551.501.81:551.594.221

Ligda, M. G. H., **Radar observation of lightning** (summary only). *Journal of Atmospheric and Terrestrial Physics*, N. Y., 15(3/4):248–250, Oct. **1959.** 3 photos, 6 refs. **DLC**—Echoes appearing on radar pictures—at wave lengths from 10 cm to 50 cm and more—are attributed to lightning. PPI photos show echoes best where precipitation echoes are weak, absent, or at the edges of strong precipitation echoes. A method is described which allows the detection of lightning that also reveals a strong precipitation pattern. *Subject Heading:* **1. Radar observation of lightning.**—*E.Z.S.*

PART III. TRANSLATIONS, RECENT MONOGRAPHS AND ANALYTICS FROM SERIALS AND COLLECTED WORKS

Note: Material listed in these sections will not be included in the monthly indexes until abstracted. The item number is mentioned for those titles which have been abstracted in previous issues of *Meteorological and Geoastrophysical Abstracts*.

A. TRANSLATIONS

Dolginov, S. Sh. and Pushkov, N. V.: **Some USSR results obtained by measuring the magnetic field of the earth with a space rocket.** (Transl. of the original Russian, **Rezul'taty izmereniia magnitnogo polia Zemli po kosmicheskoĭ rakete,** in *Akademiia Nauk SSSR, Doklady*, 129(1):77–80, 1959. 2 figs., 5 refs.) Transl. issued by U. S. Joint Publications Research Service as its JPRS, L-1981-D, Jan. 8, 1960. Available OTS as its 60-31-013. Price $0.50.

Doneaud, Andre: **Synoptic-aerological analysis of retrograde cyclones in Europe.** (Transl. of original Russian, **Sinoptiko-aerologicheskiĭ analiz obratno dvizhushchikhsia tsiklonov v Evrope,** in *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 12:1881–1888, Dec. 1959. 7 figs., table, 16 refs.) Transl. by L. G. Robbins in English language edition of the **Izvestiia,** *Bulletin of the Academy of Sciences, USSR, Geophysics Ser.*, No. 12, 1959, issued Aug. 1960, p. 1317–1323.

Gil'zin, Karl A.: **Sputniks and after.** Transl. from the Russian by Pauline Rose. London, Macdonald and Co., 1959. 285 p. 25 photos. Price 21 sh.

Kurnosova, L. V. ed.: **Artificial earth satellites, Vol. 1–2.** Transl. from the Russian. N. Y., Plenum Press; London, Chapman and Hall, 1960. 107 p. Price $9.50. Review by S. R. Singer in *Science*, Wash., D. C., 121(3411):1434, May 13, 1960.

Nikandrov, V. Ia.: **Microphysical conditions for the formation and dissipation of fog.** (Transl. of the original Russian, **Mikrofizicheskie usloviia obrazovaniia i rasseianiia tumana,** in Leningrad. Glavnaia Geofizicheskaia Observatoriia, **Sovremennye problemy meteorologii prizemnogo sloia vozdukha,** pub. Leningrad, 1958. p. 180–186. 4 tables, 16 refs.) Transl. by George S. Mitchell and Nina A. (Stepanova) Zikeev issued by U. S. Weather Bureau, Aug. 1960. DWB

Riazanov, V. A. ed.: **Limits of allowable concentrations of atmospheric pollutants.** (Transl. of original 3 vol. Russian work, Vol. 1 issued 1952, Vol. 2, 1955, and Vol. 3, 1957.) 3 vol. translation by B. S. Levine available from U. S. Office of Technical Services, 1959. About $3.00 per vol.

B. RECENT MONOGRAPHS

Arkhangel'skiĭ, Viktor L'vovich: **Vliianie Sikhote-Alinia na sinopticheskie protsessy i raspredelenie osadkov** [Influence of Sikhote-Alinsk on synoptic processes and precipitation distribution], Leningrad, Gidrometeoizdat., 1959. 163 p. maps, tables, bibliog. p. 157–164. (QC925.5.R9A7)

Baker, Robert H.: **Textbook for university and college students.** 7th ed. Princeton, N. J., Van Nostrand, 1959. 547 p. Price 52 sh. Review by D. H. P. Jones in *Nature*, London, 186(4718): 69, April 2, 1960.

Bracewell, R. N. (ed.): **Paris Symposium on Radio Astronomy.** London, Oxford Univ. Press, 1959. numerous figs. Price 120 sh. Review by V. C. Reddish in *Science Progress*, 48(191):556, July 1960.

Bugoslavskaia, N. Ia.: **Solnechnaia aktivnost' i ee vliianie na ionosferu** [Solar activity and its influence on the ionosphere]. Moscow, God. Izd-vo Lit-ry po Voprosam Sviazi i Radio, 1959. 31 p. illus., bibliog. DLC (QC879.B79)

Calvert, James: **Surface at the Pole: the extraordinary voyages of the USS Skate.** N. Y., McGraw-Hill, 1960. 220 p. illus. DLC (G630.A5C25)

Chaplygin, Evgeniĭ Il'ich: **Rukovodstvo po nabliudeniiam nad techeniiami na poliarnykh stantsiiakh i observatoriiakh** [Instructions for making observations on currents at polar stations and observatories]. Leningrad, Morskoĭ Transport, 1957. 291 p. figs., tables. DLC (GC241.C48)

Cloud Physics Conference, 2d, Woods Hole, Mass. 1959: **Physics of precipitation: Proceedings of the Second Conference ed. by Helmut Weickmann.** *American Geophysical Union, Geo-*

physical Monograph, No. 5, issued 1960. 435 p. (also issued as *National Research Council, Wash., D. C., Publication*, No. 746)

Dury, G. H.: **Face of the earth.** London, Harmondsworth, Penguin Books, 1959. 233 p. plates, figs. Review in *Science Progress*, 48(190):375, April 1960.

Eckhart, Carl Henry: **Hydrodynamics of oceans and atmospheres.** Oxford, Pergamon Press, 1960. 290 p. bibliog. Price $6.00. DLC (QA911.E25)

Firsoff, V. A.: **Strange world of the moon.** London, Hutchinson, 1959. 226 p. plates, figs. Price 25 sh. Review by T. Rackham in *Science Progress*, London, 48(191):557–558, July 1960.

Forrester, Frank H.: **Exploring the air ocean.** Illustrated by Robert Eggers. New York, Putnam, 1960. 70 p. figs. DLC (QC863.F69)

George, Joseph Johnson: **Weather forecasting for aeronautics.** With contributions from R. J. Shafer et al. N. Y., Academic Press, 1960. 673 p. illus., bibliog. DLC (TL557.R4G4)

International Congress on the Aeronautical Sciences, 1st, Madrid, Sept. 1958: **Advances in Aeronautical Sciences: Proceedings of the First International Congress.** Ed. by Th. von Kármán; A. M. Ballantyne; R. R. Dexter et al. *International Series on Aeronautical Sciences and Space Flight, Div. 9, Symposia*, issued London, Pergamon Press, 1959. 2 vol. (1144 p.) Review by A. R. Collar in *Nature*, London, 186(4726):665–666, May 28, 1960.

International Oceanographic Congress, N. Y., 1959: **Preprints of abstracts of papers to be presented at afternoon sessions.** Ed. by Mary Sears. Wash., D. C., American Association for the Advancement of Science, 1959. 1022 p. illus. Summaries in English, with abstracts in a second language. bibliog. DLC (GC2.I58 1959a).

Khakhalin, Viktor S.: **Sovremennye radiozondy** [Modern radiosondes]. Moscow, Gos. Energ. Izd-vo, 1959. 61 p. illus. (*Massovaia Radiobiblioteka*, No. 354) DLC (QC876.K53)

Kullback, Solomon: **Information theory and statistics.** N. Y., Wiley; London, Chapman and Hall, 1959. 395 p. Price 100 sh. Review by Colin Cherry in *Nature*, London, 186(4724):506, May 14, 1960.

[Levine, Ben S.]: **U.S.S.R. literature on air pollution and related occupational diseases.** "First vol. of a survey being conducted by Levine under U. S. Public Health Service grant." Available U. S. Office of Technical Services (1960?).

Milne-Thomson, L. M.: **Theoretical hydrodynamics.** London, Macmillan, 1960. 4th ed. 660 p. plates, figs. Price 65 sh. Review by O. G. Sutton in *Royal Meteorological Society, Quarterly Journal*, 86(360):433, July 1960. (For 3rd ed., 1955, *see* 9.4–7; April 1958, *Met. Abstracts*)

Moscow. Tsentral'nyĭ Institut Prognozov: **Sbornik metodicheskikh ukazaniĭ po analizu i otsenke slozhivshikhsia i ozhidaemykh agrometeorologicheskikh uslovii** [Collection of methodological instructions on the analysis and evaluation of existing and expected agrometeorological conditions.] Ed. by M. S. Kulik and V. A. Moiseĭchik. Leningrad, Gidrometeoizdat, 1957. 260 p. charts, diagrs. DLC (S600.M72)

Needham, Joseph: **Science and civilization in China, Vol. 3, Mathematics and sciences of the heavens and the earth.** (Collaboration of Dr. Wang Ling). Cambridge, Univ. Press, 1959. 877 p. Plates no. 21–95. Price 150 sh. Review by W. M. Smart in *Nature*, London, 186(4718):36–37, April 2, 1960.

Phillips, John: **Agriculture and ecology in Africa: a study of actual and potential development south of the Sahara.** N. Y., Praeger, 1960. 412 p. illus. Price $13.50. Review by Walter Deshler in *Science*, Wash., D. C., 132(3243):344–345, Aug. 5, 1960.

Podzimek, Josef: **Fysika oblaků a srážek** [Physics of clouds and precipitation]. Prague, Nakl. Československé akademie věd, 1959. 476 p. figs., photos, numerous refs. DLC (QC921.P72)

Robin, Louis: **Fonctions sphériques de Legendre et fonctions sphéroidales** [Spherical functions of Legendre and spheroidal functions], Vol. 3. Paris, 1959. DLC (QA406.R4) Review in *Geophysical Journal*, London, 3(1):137, March 1960.

Sutton, Sir Oliver Graham: **World around us.** London, English Universities Press, 1960. 122 p. figs. Price 16 sh. Review in *Royal Meteorological Society, Quarterly Journal*, 86(360):433 434, July 1960.

Taylor, Sir Geoffrey Ingram: **Scientific papers of Sir Geoffrey Ingram Taylor, Vol. 2, Meteorology, oceanography and turbulent flow.** Ed. by G. K. Batchelor. N. Y., Cambridge Univ. Press, 1960. 512 p. illus. Price $14.50.

Williamson, G. and Payne, W. J. A.: **Introduction to animal husbandry in the tropics.** London, Longmans, Green, 1959. 435 p. plates. (*Tropical Agriculture Series*) Price 48 sh. Review by John Hammond, in *Nature*, London, 186(4718):49, April 2, 1960.

Withrow, Robert B. (ed.): **Photoperiodism and related phenomena in plants and animals: Proceedings of the Conference on Photoperiodism, Oct. 29–Nov. 2, 1957,** sponsored by Committee on Photo-biology of the National Academy of Sciences—National Research Council, and supported by National Science Foundation. 903 p. Price 133 sh. Review by L. J. Audus in *Nature*, London, 187(4732):96–97, July 9, 1960.

C. METEOROLOGICAL ARTICLES APPEARING IN RECENT ISSUED PUBLICATIONS

Akademiia Nauk SSSR, Izvestiia, Ser. Geog., No. 1, Jan. 1960

Zhivago, A. V. and Udintsev, G. B.: **Sovremennye problemy geomorfologii dna okeanov i morei**, [Current geomorphological problems of ocean beds], p. 22–36

Rauner, Iu. L.: **Teplovoĭ balans lesa,** [Heat balance of a forest], p. 49–59

Ladokhin, N. P.: **Sovremennye tektonicheskie dvizheniia v zalive Proval i metodika ikh izucheniia,** [Recent tectonic movements in Proval Bay and methods of study], p. 59–66

Savina, S. S.: **Ispol'zovanie zavisimosti urozhaia ot defitsita ispareniia v otsenke effekta melioratsii,** [The indicator of melioration effect based upon the relationships between harvests and evaporation deficit], p. 75–80

Fedorov, K. N.: **Okeanografiia v Velikobritanii,** [Oceanography in Great Britain], p. 125–130

Zhivago, A. V.: **Geomorfologiia morskogo dna na Mezhdunarodnom okeanograficheskom kongresse v N'iu-Iorke (31 avgusta 11 sentiabria 1959 goda),** [Geomorphology of sea bed at the International Oceanographical Congress, New York, Aug. 31–Sept. 11, 1959], p. 136–140

Kotlaiakov, V. M.: **Doklad avstraliĭskogo gliatsiologa F. Lëve v Institute geografii AN SSSR,** [Report of the Australian glaciologist Dr. F. Loewe at the Institute of Geography of the Academy of Sciences of the U.S.S.R.], p. 160–162

No. 2, Feb. 1960

Rikhter, G. D.: **O znachenii advektsii tepla i vlagi v formirovanii prirodnykh zon,** [The role of heat and water advection in the formation of natural zones], p. 5–9

Aseev, A. A.: **Rol' tektonicheskogo i klimaticheskogo faktorov v formirovanii alliuviia ravninnykh rek,** [The role of tectonic and climatic factors in the formation of alluvium in valley rivers], p. 17–27

Bogdanov, K. T.: **Gidrologicheskie usloviia Solomonova moria,** [Hydrological conditions of the Solomon Sea], p. 117–122

Akademiia Nauk SSSR. Okeanograficheskaia Komissiia, Trudy, Vol. 3, 1958 (Mezhduvedomstvennoe Soveshchanie po Okeanologicheskomu Izucheniiu Dal'nevostochnykh Morei i Severnoĭ Chasti Tikhogo Okeana, 1954, Okeanologicheskie issledovaniia Severo-zapadnoi chasti Tikhogo okeana)

Kort, V. G.: **Issledovaniia dal'nevostochnykh morei i Tikhogo okeana, provedennye Institutom okeanologii AN SSSR v 1949–1954 gg,** [Investigations of the Far Eastern seas and the Pacific Ocean conducted by the Oceanographic Institute of the Academy of Sciences of the U.S.S.R. in 1949–1954], p. 3–12

Badogom, K. S.: **O zhelatel'nom napravlenii rabot Instituta okeanologii AN SSSR na moriakh Dal'nego Vostoka,** [Desirable orientation of the work of the Oceanographic Institute of the Academy of Sciences of the U.S.S.R. in the Far Eastern seas], p. 13–19

Il'inskiĭ, O. K.: **Proekt razmeshcheniia korableĭ pogody na Dal'nem Vostoke,** [Project of locating weather ships in the Far East], p. 20–23

Dabrovol'skiĭ, A. D.: **Vazhneĭshie problemy fizicheskoĭ okeanologii severo-zapadnoĭ chasti Tikhogo okeana,** [Most important problems of physical oceanography of the northwestern part of the Pacific Ocean], p. 24–27

Batalin, A. M.: **Okeanologicheskie issledovaniia v dal'nevostochnykh vodakh v sviazi s razvitiem rybnogo promysla,** [Oceanographic investigations in the Far Eastern waters in relation to the development of the fishing industry], p. 28

Bruevich, S. V.: **Khimicheskie issledovaniia Instituta okeanologii AN SSSR na dal'nevostochnykh moriakh i prilegaiushcheĭ chasti Tikhogo okeana,** [Chemical investigations by the Oceanographic Institute of the Academy of Sciences of the U.S.S.R. in the Far Eastern seas and adjoining area of the Pacific Ocean], p. 29–31

Angewandte Meteorologie, Berlin, Vol. 3, No. 10, April 1960

Undt, W.: **[Obituary of] Dr. Franz Sauberer,** p. 293–295

Fuss, Franz: **Einfluss der Kalkung auf die Temperatur von Baumstämmen im Winter und Frühjahr,** [Influence of a coat of lime on the temperature of tree trunks in winter and spring], p. 295–311

Höhne, Werner: **Ein oszillierendes Thermoelement und seine Anwendung bei Temperatur- und Feuchtemessungen,** [An oscillating thermoelement and its use during temperature and humidity measurements], p. 312–315

Raeuber, A.: **Zur rechnerischen Bearbeitung phänometrischer Untersuchungen,** [Mathematical analysis of phenometric investigations], p. 315–320

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Lützke, R.: **Erfahrungen mit einer transportablen thermoelektrischen Registrierapparatur bei kleinklimatischen Untersuchungen,** [Experiences with a portable thermoelectric recording apparatus in microclimatic research], p. 325–333

Wójtowicz, Wł.: **Die Auswertung der klassischen Klimadaten in der Kurortklimatologie am Beispiel des Talkessels von Kłodzko (Glatz),** [Analysis of conventional climatic data in resort climatology, using the Kłodzko Basin as an example], p. 333–338

Simonis, R.: **Modifizierung phänologischer Daten durch lokalklimatische Sonderverhältnisse,** [Modification of phenological dates by particular local climatic conditions], p. 339–345

Hoffmann, K.: **Niederschlagsmessungen in einer Apfel-Viertelstammanlage,** [Precipitation measurement in a quarter-grown apple orchard], p. 345–351

Annales de Géophysique, Paris, No. 16, Vol. 1, Jan./March 1960

Jobert, G.: **Perturbations des marées terrestres,** [Disturbances of terrestrial tides], p. 1–55

Barbier, Daniel and Glaume, Jeannine: **Correlations entre les intensités de diverses radiations de la luminescence atmosphérique nocturne,** [Correlations between the intensities of various radiations of the nocturnal atmospheric luminescence], p. 56–76

Herrinck, P.: **Etude de l'évolution de la couche ionosphérique F_2 à Léopoldville-Binza,** [Study of the evolution of the F2 ionospheric layer at Leopoldville-Binza], p. 77–87

Gadsden, M.: **Studies of the upper atmosphere from Invercargill, New Zealand, Pt. 5, The frequency of occurrence of auroras and its dependence on magnetic activity and temporal functions,** p. 88–104

Thulin, Åke: **Une détermination absolue de *g*, au pavillon de Breteuil, par la méthode de la chute d'une règle divisée,** [Absolute gravity determination, at the Breteuil Pavilion, by means of a falling graduated rule], p. 105–127

Corcuff, Y.: **Choix d'un paramètre caractérisant les sifflements radioélectriques,** [Choice of a parameter characterizing radioelectric whistlers], p. 128–139

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